

Louisiana State University LSU Digital Commons

LSU Doctoral Dissertations

Graduate School

2009

The expansion and diversification of the export sector and economic growth: the Costa Rican experience

Gustavo Filipe Canle Ferreira

Louisiana State University and Agricultural and Mechanical College, gferre3@tigers.lsu.edu

Follow this and additional works at: https://digitalcommons.lsu.edu/gradschool_dissertations



Part of the [Agricultural Economics Commons](#)

Recommended Citation

Ferreira, Gustavo Filipe Canle, "The expansion and diversification of the export sector and economic growth: the Costa Rican experience" (2009). *LSU Doctoral Dissertations*. 3188.

https://digitalcommons.lsu.edu/gradschool_dissertations/3188

This Dissertation is brought to you for free and open access by the Graduate School at LSU Digital Commons. It has been accepted for inclusion in LSU Doctoral Dissertations by an authorized graduate school editor of LSU Digital Commons. For more information, please contact gradetd@lsu.edu.

**THE EXPANSION AND DIVERSIFICATION OF THE EXPORT SECTOR AND
ECONOMIC GROWTH: THE COSTA RICAN EXPERIENCE**

A Dissertation
Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in
The Department of Agricultural Economics & Agribusiness

by
Gustavo Filipe Canle Ferreira
B.A., Cooperativa de Ensino Universidade Lusíada, 2000
M.B.A. McNeese State University, 2003
December, 2009

DEDICATION

I dedicate this dissertation to almighty God for giving me infinite inspiration and strength. To my wonderful wife, Danielle To my little baby girl, Amália, and to my beloved family in Portugal and Spain.

ACKNOWLEDGMENTS

I want to express my most sincere gratitude to my honorable advisor, Dr. R. Wes Harrison, who from day one trusted my professional skills. His guidance and advice has been essential to the completion of my Ph.D program. Furthermore, I have been very fortunate and honored to work for him as his research associate. This professional experience, together with my dissertation work, has helped me to built confidence in my researcher skills, and today I believe I am ready to develop my own research program. I will be indebted to Dr. R. Wes Harrison for the rest of my life.

I would like to extend my appreciation to the distinguished members of the dissertation committee. Dr. Michael E. Salassi, I want to thank you for your willingness to serve on my committee. I believe you did an outstanding job teaching your operation research class. Dr. P. Lynn Kennedy, I too want to thank you for your willingness to serve on my committee despite being the advisor of many graduate students. Your international trade class did inspire me in the selection of my dissertation topic, and helped me in developing a great interest in the field. Dr. W. Douglas McMillin, I want to thank you for being a part of my graduate committee and for your valuable assistance with the time series procedures. I truly enjoyed every lecture in your macroeconomics class. I also want to express my gratitude to Dr. Henry J. Jr. Mascagni for serving as the dean's representative on my dissertation committee.

I also want to express my special gratitude to Dr. Gail L. Cramer who as the head of the department of Agricultural Economics and Agribusiness has been doing an outstanding job. I will never forget our first meeting, his personal charisma and encouraging words were more than enough to convince me to join this program. Thank you for believing in me Dr. Cramer. Likewise, I want to thank Dr. Matiur Rahman and Dr. Hector Zapata for their helpful suggestions with respect to econometric methodologies, and to Dr. Christopher F. Baum for

his assistance with the Stata software. Additionally, I would like to thank Mrs. Debbie and Mrs. Pam for their excellent administrative job.

There is a group of personal friends that I want to thank. Firstly, I want to thank Pablo Garcia who I regard as a brother. Together we shared the highest and lowest moments in this program, but with hard work and determination we made it this far. I am forever thankful to you Pablo. To James Henderson, Tina Wilson and Cheikna Dedah for being such good classmates.

Last but not least, I have to thank my beloved family members. To my lovely wife Danielle for her endless patience and understanding during this long journey called graduate school. To my dear parents. Thanks to their support and encouragement, I have been able to turn most of my dreams into reality. To my brother Pablo, who has always been a role model to me with his determination, honesty and compassion. To my grandparents and uncles in Spain for always encouraging me in my endeavors. To all my in-laws who have been my new family in the United States. To my soon-to-be-born little baby girl, Amália. She will make everything in this life journey worthy. Thank you to all of you

TABLE OF CONTENTS

DEDICATION	ii
ACKNOWLEDGMENTS	iii
ABSTRACT.....	vii
CHAPTER 1: INTRODUCTION	1
1.1 Introduction.....	1
1.2 Problem Statement	3
1.3 Justification	4
1.4 Research Objectives.....	5
1.5 Procedures.....	5
1.5.1 Data.....	5
1.5.2 Data Analysis.....	6
1.6 Outline of the Dissertation.....	7
1.7 References.....	7
CHAPTER 2: THE DIVERSIFICATION OF THE EXPORT SUPPLY: LESSONS FROM COSTA RICA.....	10
2.1 Introduction.....	10
2.2 Definition and Measures of Export Diversification.....	13
2.2.1 Measure of Horizontal Export Diversification	13
2.2.2 Measure of Vertical Export Diversification.....	14
2.2.3 Herfindahl Export Concentration Index.....	15
2.3 Historical Overview	17
2.3.1 Period 1: Import Substitution Industrialization (1960 to 1979).....	17
2.3.2 Period 2: Debt Crisis and the Structural Reforms (1980-1983).....	20
2.3.3 Period 3: Foreign Direct Investment and Export Diversification (1984-2006)	22
2.4 Discussion and Concluding Remarks	29
2.5 References.....	31
CHAPTER 3: FROM COFEE BEANS TO MICROCHIPS: EXPORT DIVERSIFICATION AND ECONOMIC GROWTH IN COSTA RICA	33
3.1 Introduction.....	33
3.2 Review of Empirical Literature	34
3.3 Overview of Costa Rica's Export Diversification Experience	38
3.4 Theoretical Model and Data.....	39
3.4.1 The Model.....	39
3.4.2 The Data.....	42
3.5 Econometric Methodology.....	43
3.5.1 Test for Univariate Integration.....	43
3.5.2 Test for Multivariate Cointegration (ARDL).....	44
3.5.3 Estimation of Long-run Elasticities: Stock-Watson dynamic OLS	45
3.6 Empirical Results	46
3.6.1 Tests for Unit Roots	46
3.6.2 Multivariate Integration: ARDL	48
3.6.3 Long-run Elasticities: Stock-Watson DOLS.....	49
3.7 Concluding Remarks.....	51

3.8 References.....	53
CHAPTER 4: ON THE CAUSAL LINKS BETWEEN EXPORTS AND ECONOMIC GROWTH IN COSTA RICA	56
4.1 Introduction.....	56
4.2. Empirical Literature Review and Theoretical Framework	58
4.2.1 Empirical Literature	58
4.2.2 Theoretical Framework.....	62
4.3 Exports and Economic Growth in Costa Rica	64
4.4 Data and Econometric Methodology	67
4.5 Empirical Results.....	70
4.5.1 Unit Root Tests	70
4.5.2 Granger Causality Tests.....	73
4.6 Conclusions and Policy Implications.....	75
4.7 References.....	77
CHAPTER 5: SUMMARY AND CONCLUSIONS.....	81
5.1 References.....	85
APPENDIX 1: DEFINITIONS OF ACRONYMS	86
APPENDIX 2: VARIABLES DEFINITIONS AND DATA SOURCES.....	87
APPENDIX 3:VARIABLES PLOTS	89
VITA	93

ABSTRACT

A large body of empirical literature has investigated the linkages between exports and output. Nevertheless, empirical evidence remains inconclusive and the topic remains open to discussion. Additionally, a number of studies have examined the positive effects that export diversification may have on economic growth. Within the Latin America region, Costa Rica has been lauded for its long democratic tradition, relative economic stability, and for evolving from being a small economy heavily reliant on exports of coffee and bananas, to become the largest software exporter per capita in Latin America. This study examined the impact that the expansion and diversification of Costa Rican export supply had on economic growth.

The first study provides a historical analysis of the export diversification experience in Costa Rica from the 1965 until the present. For that, a chronological assessment of the main policies and events leading to the transformation of Costa Rican export supply was presented. This paper concludes that Costa Rica was able to move its economy away from commodity dependence because of important amounts of foreign direct investment over the last two decades. Furthermore, export diversification in Costa Rica is characterized by weak linkages between multinational corporations, operating in the free trade zones, and the rest of the economy.

The second paper tests the hypothesis of a long-run relationship between export diversification and economic growth in Costa Rica via externalities of learning-by-exporting and learning-by-doing. The period of analysis was from 1965 to 2006, and two types of statistical methodologies were used: the bounds test for cointegration within a distributed lag (ARDL) framework and a dynamic OLS (DOLS) model. Overall, results concluded that export diversification had no long-run effect on economic growth during the study period.

The third paper tests the export-led growth (ELG) hypothesis in Costa Rica using a modified version of the Wald test for three different models for the period of 1960 to 2007

and 1965 to 2006. The ELG hypothesis was confirmed only when imports were included in the estimation. Granger-causality was also found running from imports to exports likely due to large amounts of imported inputs for multinational firms.

CHAPTER 1: INTRODUCTION

1.1 Introduction

There has been little empirical research on the linkages between export diversification and long term economic growth. The literature that has been conducted on this issue has attempted to answer two main questions. The first relates to the positive effects that export diversification may have on long-run economic growth, with several studies lending support to this hypothesis (Al-Marhubi, 2000; Gutiérrez-de-Piñeres and Ferrantino, 2000; Feenstra and Kee, 2004; Herzer and Nowak-Lehman, 2006; and Matthee and Naudé, 2007). The other important question is whether it is possible for a country to improve its economic performance when it exports different types of goods. A series of studies found that an increase in the ratio of manufacturing exports to total exports has a positive effect on economic growth (Fosu, 1990; Levin and Raut, 1997; Greenaway et al., 1999; Moreno-Brid and Pérez, 2003, Balaguer and Cantavella-Jordá, 2004).

On the other hand, the relationship between exports growth and economic growth, known as the Export-Led Growth (ELG) hypothesis, has been extensively analyzed by a significant body of literature (for a recent and comprehensive survey of the empirical research on the ELG hypothesis see Giles and Williams (2000a) and Bahmani-Oskooee and Economidou (2009)). Advocates of the ELG hypothesis present a series of arguments that buttress export-oriented development strategies, and numerous studies have pointed at the advantages of outward-oriented trade policies. Because of the lack of long time-series data, early research consisted mainly of cross-country analysis that found causal relationships between export and output growth (Michalopoulos and Jay, 1973; Voivodas, 1973; Michaely, 1977; Balassa, 1978a; Heller and Porter, 1978; Tyler, 1981; Feder, 1983; and Kavoussi, 1984). Other studies employed time series econometrics, which often yielded results that failed to support the ELG hypothesis (Jung and Marshall, 1985; Chow, 1987; Hsiao, 1987;

and Ahmad and Kwan, 1991). More recent empirical research has employed cointegration and error-correction modeling, and found evidence of a bi-directional causality between exports and growth (Kugler and Dridi, 1993; Ahmad and Harnhirun, 1995). In sum, evidence on this topic has been mixed and sometimes conflicting, thus the ELG hypothesis remains a topic of interest.

Costa Rica is an interesting case study not only because of its long democratic tradition and relative economic stability, but also because it managed to evolve from being a country heavily reliant on coffee and banana exports to become the largest software exporter per capita in Latin America. Furthermore, Costa Rica has experienced an important increase in volume of its total exports for the last 20 years. However, these progresses in terms of export diversifications and export growth have been, to a great extent, only possible due to large amounts of foreign direct investment (FDI) located in free trade zones (FTZ). According to Arce et al. (2008), in 2007 exports from FTZs accounted for almost 55 percent of Costa Rica's total exports and included mainly industrial products produced by multinational corporations (i.e. computer parts, electronics, medical equipment, textiles, and processed food products).

This dependence of Costa Rican exports on foreign firms is the result of an industrialization strategy based on high-tech FDI. The rationale for this policy is that capital investment from these industries is assumed to have a greater potential for spillover effects in comparison to other not so technologically intensive sectors. Costa Rican authorities also expected the formation of backward linkages between the established foreign and domestic firms. Nevertheless, several scholars have questioned the real benefits of this development model for the overall economy.

No study has yet investigated the effects of export diversification on economic growth in Costa Rica, and evidence of the ELG hypothesis for this country has been inconclusive,

warranting further investigation. Modern time series econometrics is used to examine both issues.

1.2 Problem Statement

For over two decades Costa Rica's economic development has been based on an import substitution industrialization (ISI) strategy, which led to a period of high economic growth in the 1960s and 1970s. The ISI is a protectionist trade and economic policy that seeks to reduce a country's foreign dependency through the local production of industrial goods. Its implementation involves imposing high tariff rates for consumer goods, low import taxes for intermediates and capital goods, and export taxes applied on those goods in which a country has a strong comparative advantage. However, in the wake of a severe economic crisis in the early 1980s, and with the support of financial and development international institutions (i.e. the International Monetary Fund and the USAID), the government of Costa Rica began implementing numerous policies and structural reforms seeking to expand and diversify the country's exports. Additionally, a series of incentives were used to attract foreign direct investment (FDI) from high-tech sectors. Consequently, in the last two decades, Costa Rica increased its exports volume, and export of goods and services as a share of Costa Rican Gross Domestic Product (GDP) went from 21 percent in 1960 to almost 50 percent in 2007. In terms of export diversification there were also important progresses with the number of export sectors increasing from 114 in 1965 to 161 in 2006, and the share of manufactured exports as a percentage of total merchandise exports reaching almost 65 percent in 2006 in comparison to 14.6 percent in 1965 (World Bank, 2008).

The economic reasoning for this policy agenda is founded on the export-led growth hypothesis (ELG), which suggests that exports are a major determinant of economic growth, and on previous empirical evidence showing that export diversification is conducive to higher per capita income growth. Nevertheless, and despite a relatively good economic performance

in the last 20 years, Costa Rica has yet to regain the same high rates of economic growth registered during the ISI period. Some researchers have argued that the export promotion strategy in Costa Rica, although well implemented, has been overly dependent on FDI in high tech industries operating almost as enclaves in free trade zones, whose output is almost exclusively exported. In this case, the presence of high-tech industries has contributed to the expansion and diversification of Costa Rican exports but, failed to accelerate output growth and generate expected linkages and spillovers with the rest of the economy.

1.3 Justification

An empirical assessment of whether or not export diversification and export expansion efforts have led to higher rates of growth is relevant not only for the ELG literature, but also for economic development literature. Costa Rica is often regarded as a “success story” in terms of economic and social development within the Latin American region. In 2007, Costa Rica ranked sixth in all Latin America in terms of national income per capita, with a GNI (PPP) per capita of \$10,510. Costa Rica was surpassed only by larger economies such as Mexico, Argentina, Chile, Venezuela and Panama (World Bank, 2009). Costa Rica has also ranked among the highest within the Latin American region in terms of human development (United Nations, 2008). Furthermore, this Central American country has successfully implemented important economic reforms as a response to an economic crisis that exposed the shortcomings of the hitherto adopted development strategy - import substitution industrialization. A new economic model emerged based on export promotion and export diversification, reduction of government spending, and the attraction of foreign investment from high-tech industries. Thus, investigating how much a dynamic and well diversified export sector has contributed to Costa Rica’s favorable economic performance will aid governments from other developing nations and economic development agencies in designing and implementing more appropriate pro-growth policies. These lessons can be

particularly important for the remaining neighboring Central American countries, which have been affected by insufficient economic growth, political instability, and where poverty remains pervasive. In sum, this study will provide empirical evidence on whether further efforts in diversifying and promoting exports are warranted, and have potential to induce further economic growth.

1.4 Research Objectives

The primary objective of this study is to examine the impact that exports have had on economic growth in Costa Rica for the last four decades. Some specific objectives are:

1. Analyze the export diversification process that has been taking place in Costa Rica since the 1960s.
2. Empirically evaluate the existence of a long-run relationship between vertical and horizontal export diversification and economic growth in Costa Rica for the period of 1965-2006.
3. To test the causal relationship between exports and output growth in Costa Rica between 1960 and 2007.

1.5 Procedures

1.5.1 Data

This study will use annual data for Costa Rica for the periods 1965-2006 and 1960-2007 on the following variables: a measure of horizontal export diversification, a measure of vertical export diversification, a measure of export concentration, real GDP, total labor force, gross fixed capital formation, real exports, and real imports. All variables are measured in inflation-adjusted US\$ (base year = 2000), except for labor force which is measured in total economically active population, horizontal export diversification measured in number of export sectors, and vertical export diversification which is measured as the percentage of manufacturing exports to total exports. The data for all variables were obtained from the 2008

World Development Indicators online version, and from the United Nations dataset (COMTRADE). Complete variable definitions and data sources are provided in Appendix 2.

1.5.2 Data Analysis

- **Objective 1**

This objective is achieved by first computing three different measures of export diversification for the period of 1965 to 2006: vertical export diversification; horizontal export diversification; and an export concentration index. These measures are then examined within a historical and comprehensive overview of the export diversification process in Costa Rica. The study period is divided into three historical sub-periods according to a series of relevant policies and events.

- **Objective 2**

A generalization of the model proposed by Herzer and Nowak-Lehmann (2006) is used to test the hypothesis that export diversification has influenced economic growth in Costa Rica via externalities of learning-by-exporting and learning-by-doing. An autoregressive distributed lags model (ARDL) and a dynamic OLS (DOLS) econometric procedure is used to test the existence of a long-run relationship between export diversification and economic growth.

- **Objective 3**

The causal relationship between exports and economic growth in Costa Rica is examined using of a modified version of the Wald test (MWALD). To overcome some of the shortcomings in previous research, the present study will estimate three different empirical models. The first model will test the ELG hypothesis using a bivariate framework, while a second model will test Granger-causality between real exports and real output with the inclusion of real imports. In a third model, the ELG hypothesis will be tested using a Cobb-Douglas production function where exports are included as an additional input along with

capital and labor. The results from these three models will then be compared, and their robustness tested.

1.6 Outline of the Dissertation

This work accomplishes the three objectives through a “journal-article-style” dissertation, given in chapters two, three, and four. Chapter two presents an in-depth analysis of the main policies and events that led to the transformation of the Costa Rican export supply. In addition, three measures of export diversification are computed and analyzed for the period of 1965-2006. In Chapter three a long-run relationship between export diversification and economic growth in Costa Rica is examined. The export-led growth hypothesis is tested in Chapter four. Finally, an overall summary is included in chapter five.

1.7 References

- Ahmad, j. and Harnhirun, S. (1995). Unit roots and cointegration in estimating causality between exports and economic growth: Empirical evidence from the ASEAN countries. *Economic Letters*, 49, 329-34.
- Ahmad, J. and Kwan, A. C. C. (1991). Causality between exports and economic growth: Empirical evidence from Africa. *Economic Letters*, 37, 243-248.
- Al-Marhubi, F. (2000). Export diversification and growth: an empirical investigation, *Applied Economics Letters*, 7, 559-562.
- Arce, R., Chacón, E., Chaves, G., and Tristán A. (2008) Análisis de las estadísticas de exportación Costa Rica, 2007. Promotora del Comercio Exterior de Costa Rica (PROCOMER): Dirección de Estudios Economicos. San José, Costa Rica.
- Bahmani-Oskooee, M. and Economidou, C. (2009). Export led growth vs. growth led exports: LDCs Experience. *The Journal of Developing Areas*, 42(2), 179-212.
- Balaguer, J. and Cantavella-Jordá, M. (2004). Structural change in exports and economic growth: cointegration and causality analysis for Spain (1961-2000), *Applied Economics*, 36, 473-477.
- Balassa, B. (1978a). Exports and growth: Further evidence. *Journal of Development Economics*, 5(2), 181-189.
- Chow, P.C. Y. (1987). Causality between export growth and industrial performance: evidence from NICs. *Journal of Development Economics*, 26(1), 55-63.

- Feder, G. (1983). On exports and economic growth. *Journal of Development Economics*, 12, 59-73.
- Feenstra, R., and H.L. Kee (2004) "Export Variety and Country Productivity," *NBER Working Paper* 10830, National Bureau of Economic Research: Cambridge MA.
- Fosu, K. (1990). Export composition and the impact of exports on economic growth of developing economies, *Economic Letters*, 34, 71-76.
- Giles, J.A. and Mirza, S. (1998). Some pretesting issues on testing for Granger non-causality. Mimeo, Department of Economics, University of Victoria.
- Greenway, D., Morgan, W., and Wright P. (1999). Exports, export composition and growth, *The Journal of International Trade & Economic Development*, 8:1, 41-51.
- Gutiérrez-de-Piñeres, S. A. and Ferrantino, M. (2000). Export Dynamics and Economic Growth in Latin America: A Comparative Perspective. Ashgate Publishing, 2000.
- Heller, P. S. and Porter, R. C. (1978). Exports and growth: An empirical reinvestigation. *Journal of Development Economics*, 5, 191-3.
- Herzer, D. and Nowak-Lehmann D. F. (2006). What does export diversification do for growth? An econometric analysis, *Applied Econometrics*, 38, 1825-1838.
- Hsiao, M. W. (1987). Tests of causality and exogeneity between exports and economic growth: The case of Asian NICs. *Journal of Economic Development*, 12, 143-159.
- Jung, W.S. & Marshall, P.J. (1985). Exports, growth and causality in developing countries. *Journal of Development Economics*, 18, 1-12.
- Levin, A. and Raut, L. K. (1997). Complementarities Between Exports and Human Capital in Economic Growth: Evidence from the Semi-industrialized countries, *Economic Development and Cultural Change*, 46(1), 155-174.
- Kavoussi, R. M. (1984). Export expansion and economic growth: Further empirical evidence. *Journal of Development Economics*, 14, 241-50.
- Kugler, P. and Dridi, J. (1993). Growth and exports in LDCs: A multivariate time series study. *International Review of Economics and Business*, 40, 759-67.
- Matthee, M. and Naudé, W. (2007). Export diversity and regional growth: Empirical evidence from South Africa, United Nations University Research Paper No. 2007/11.
- Michaely, M. (1977). Exports and economic growth: An empirical investigation. *Journal of Development Economics*, 4, 49-53.
- Michalopoulos, C., and Jay, K. (1973). Growth of exports and income in the developing world: a neoclassical view. Discussion Paper No. 28, US Agency of International Development, Washington DC.

Moreno-Brid, J. C. and Pérez, E. (2003). Trade liberalization and economic growth in Central America, The Economic Commission for Latin America (ECLA) Review 81, Santiago, Chile.

Tyler, T.W. (1981). Growth and export expansion in developing countries: Some empirical evidence. *Journal of Development Economics*, 9(1), 121-130.

Voivodas, C. S. (1973). Exports, foreign capital inflow, and economic growth. *Journal of International Economics*, 3, 337-49.

Human Development Indices: A statistical update 2008 - HDI rankings. United Nations Development Programme<<http://hdr.undp.org/en/statistics/>>

The World Bank, Data and Statistics. Gross national income per capita 2008, Atlas method and PPP
<<http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20399244~menuPK:1504474~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html#ranking>>

CHAPTER 2: THE DIVERSIFICATION OF THE EXPORT SUPPLY: LESSONS FROM COSTA RICA

2.1 Introduction

Since the early sixties there has been a long-run trend toward export diversification in Latin America encouraged by the Economic Commission on Latin America (ECLA). More specifically, the ECLA has promoted diversification into manufacturing exports based on the premise that manufactured goods have more stable demand and supply conditions comparatively to primary commodities. However, many export diversification experiences in Latin America have been characterized by export diversification among primary goods exports rather than by increases in the share of manufactures exports (Gutiérrez-de-Piñeres and Ferrantino, 2000). The most commonly cited example of this is Chile's successful adoption of an export diversification strategy based on the growth of new agricultural exports, which in turn fostered economic growth (Gutiérrez-de-Piñeres and Ferrantino, 1997; Herzer and Nowak-Lehmann, 2006).

Although with marked differences with respect to the Chilean case, Costa Rica also managed to gradually diversify its export supply, and gain new competitive advantages in the manufacturing sector. Costa Rica is a small and open economy that it is often lauded for relative economic stability and a long democratic tradition. Its population of little over four million people has an income per capita that is above the Latin American average. Following the disbandment of the national army in 1948, which freed up millions of dollars, the Costa Rican government began to play a more active role in the economy. Costa Rica became a forerunner in Latin America in the provision of universal education and healthcare to its population due to large public investments in education and health sectors during the 1950s, 60s, and 70s (Villasuso, 1999). In terms of economic performance, figure 1 reveals that from 1960 to 2007 Costa Rica has consistently outperformed Latin America. Despite some volatility, the economy of Costa Rica has expanded at an average annual rate of almost five

percent, while Latin America grew at an average rate of less than four percent. Nevertheless, during the debt crisis that affected the region in the early 1980s, the economy of Costa Rica suffered a more severe contraction than the average of Latin America.

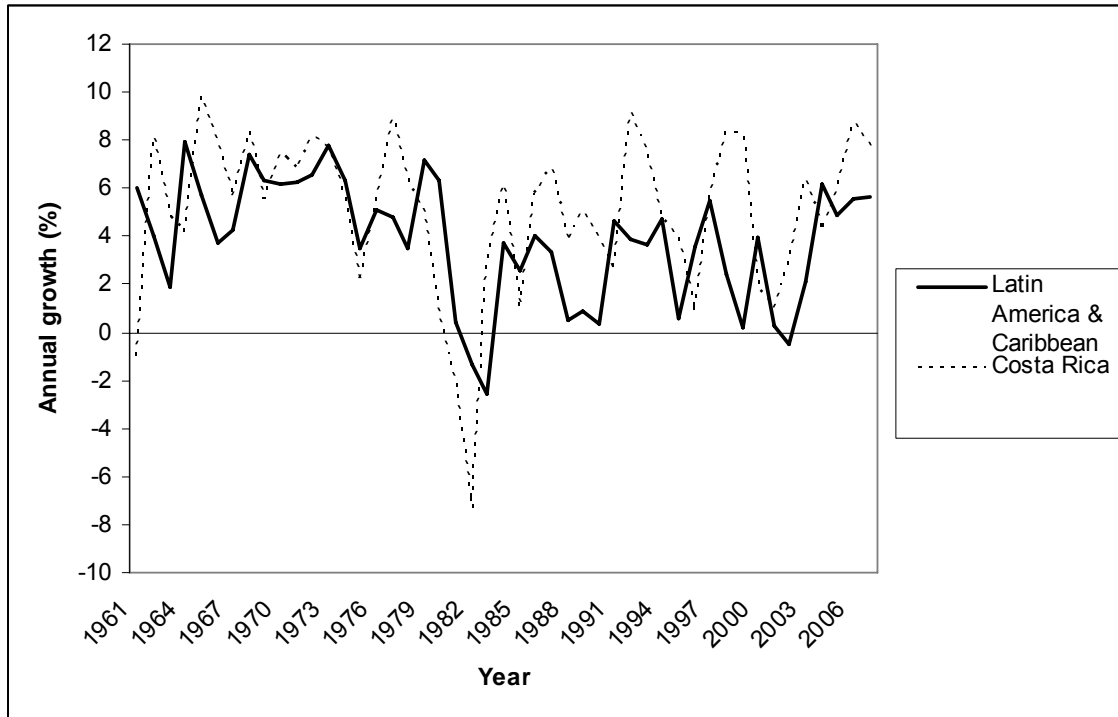


Figure 1: GDP annual growth (%) of Costa Rica and Latin America (1960-2007).
Source: World Development Indicators, World Bank (2008).

In addition to its relative successful economic record, Costa Rican export supply has experienced relatively recent and important changes in its structure. This nation went from being highly reliant on exports of a few primary goods to having flourishing high-tech and medical equipment manufacturing export sectors, and well diversified agricultural and service sectors. As shown in table 1, in 2007 the electronic and computer parts sectors alone accounted for over one quarter of Costa Rica's total exports. Other industrial sectors such as medical equipment, medicines and apparel products accounted for 13 percent of the total exports in 2007. The Costa Rican government has played a key role in these achievements by implementing policies that promoted industrialization and the reduction of the country's dependence on the agricultural sector. These export diversification efforts date back to the

1970s, however they gained particular momentum in the wake of the severe economic crisis in the early 1980s¹ (Vos et al., 2006).

Table 1: Costa Rica's Export Composition (2007)

Products	Share of total exports (%)
Modular circuits	15%
Computer parts	11%
Bananas	7%
Pineapples	5%
Serum infusion and transfusion equipment	5%
Textiles and apparel	5%
Medicines	3%
Coffee	3%
Others	46%

Source: PROCOMER

Unlike other developing countries, Costa Rica had the human, institutional and financial resources needed to design and implement a comprehensive export promotion and diversification strategy. Moreover, Costa Rican authorities were quite successful in creating export processing zones that attracted foreign capital investments from sectors with high technological content throughout the 1990s. In sum, what makes Costa Rica an interesting case study is that its well diversified economy is the result of long-term public policies that have been consistently implemented since the 1960s, coupled with the establishment of high-tech multinational corporations. Hence, a historical analysis of such policies and events will be a useful lesson for future policy makers in other developing nations. Following a thorough literature review, there was no study found investigating the export diversification process that transformed Costa Rica into a technology and knowledge-driven economy. Hence, this paper contributes to the export diversification and economic development literature by presenting a chronological assessment of the main policies and events that transformed the export supply of Costa Rica. This paper is organized as follows: section 2 defines and

¹ Export diversification policies in Chile were also a response to the economic crisis that affected the nation during the 1970s.

introduces three different measures of export diversification; section 3 presents a comprehensive overview of the Costa Rican export diversification process from the 1960s to date, and divides the time period in analysis into three historical sub-periods according to a series of relevant events; and the last section offers a discussion and concluding remarks.

2.2 Definition and Measures of Export Diversification

A formal definition of export diversification should include both the broadening of economic export activities and the degree to which each sector contributes to the overall country's export. In other words, it should include both horizontal and vertical export diversification processes. Taylor (2007) argues that horizontal export diversification happens when there is an increase in the range of products exported, while vertical diversification occurs when there are noteworthy changes in the shares of each export sector. Matthee and Naudé (2007) define horizontal export diversification as an increase in the number of export sectors, and vertical diversification as a shift in the composition of exports from primary to manufacturing products. This study uses the latter definitions to construct the measures of both horizontal and vertical export diversification for Costa Rica.

2.2.1 Measure of Horizontal Export Diversification

To measure horizontal export diversification, the number of export sectors classified by the Standard International Trade Classification (SITC) at the three-digit level is used. This measure is computed for the period of 1965 to 2006 using the United Nations dataset (COMTRADE). Figure 2 shows the changes in the number of Costa Rica export sectors during this period, and it reveals a modest upward trend². Between 1965 and the early 1980s there was little change in the number of export sectors, with the number oscillating between 120 and 140. From the mid-1980s onwards, and as a result of the public export promotion policies implemented after the economic crisis in the early 1980s, the number of export

² A plausible explanation for such slow growth may not related to specific conditions and events in Costa Rica, but rather to the fact that it naturally takes long periods of time for a country to develop a new export sector.

sectors increased to a new higher level ranging from 140 to over 160 export sectors. This structural change will be analyzed later in more detail.

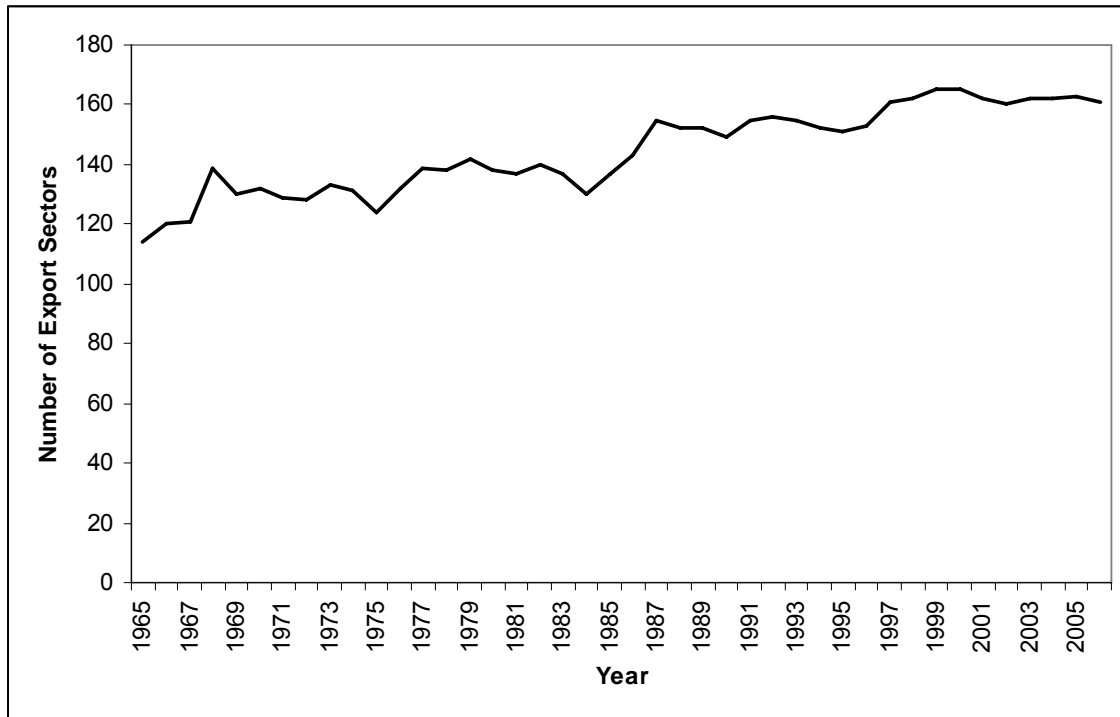


Figure 2: Number of Export Sectors in Costa Rica (1965 -2006).
Source: COMTRADE.

2.2.2 Measure of Vertical Export Diversification

The selected measure for vertical export diversification is the ratio of manufactured exports to total exports also for the period 1965-2006. The data is collected from the World Development Indicators (2008). As figure 3 reveals, the share of manufactures exports to total exports experienced little change from 1965 to 1996, oscillating between 20 and 30 percent. However, around 1997 there was a singular and very significant upward shift that pushed the share of manufactured exports up to over 60 percent, and remained in those levels for the remainder of the study period. This important shift was directly related to the decision of Intel to open a microprocessor plant in Costa Rica in 1997. The size and the subsequent implications of this investment merit a more extensive analysis later in the paper.

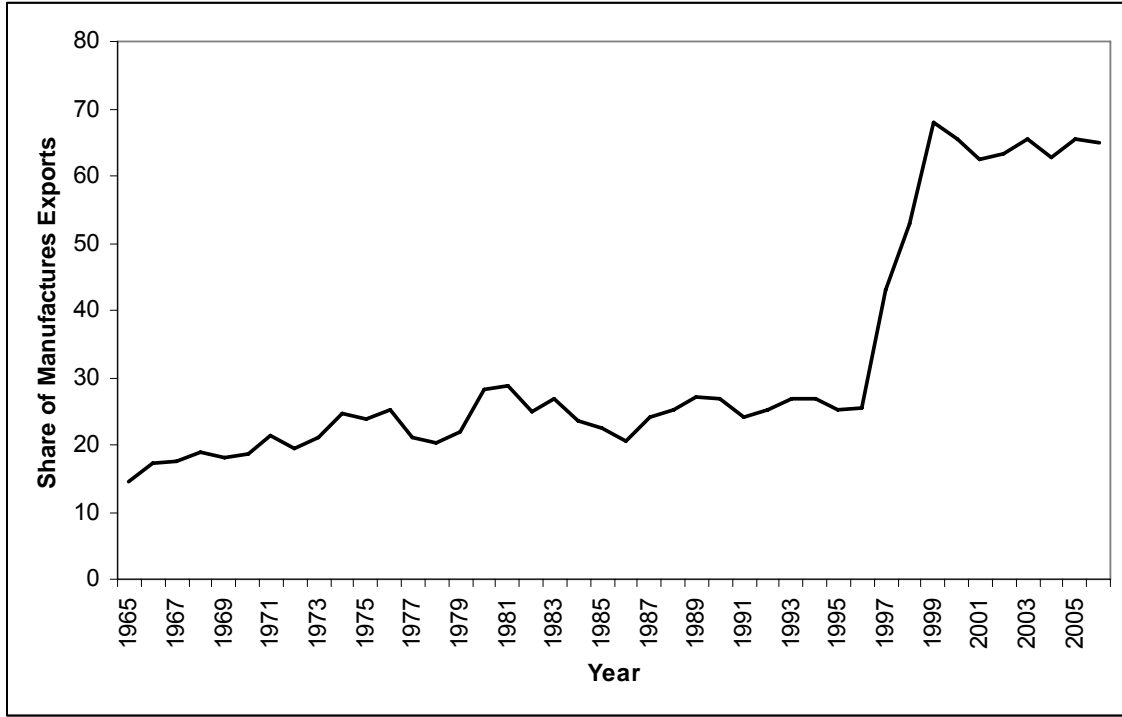


Figure 3: Ratio of Manufactured Exports to Total Exports of Costa Rica (1965 -2006).
Source: World Development Indicators, World Bank (2008).

2.2.3 Herfindahl Export Concentration Index

A measure of export concentration, the Herfindahl Export Concentration Index, is presented to be contrasted with the two measures of export diversification, and it is computed as follows:

$$H_t = \frac{\sqrt{\sum_{i=1}^n \left(\frac{x_{it}}{X_t}\right)^2} - \sqrt{1/n}}{1 - \sqrt{1/n}} \quad (1)$$

where

H_t is the concentration index in year t ,

x_{it} is the value of exports from sector i in year t ,

n is number of export sectors , and

$$X_t = \sum_{i=1}^n x_{it}$$

This measure is based on the Herfindahl index often applied to measure industry concentration. When the index value approaches one, it means that a country has a greater reliance on a limited group of exports, while a value closer to zero represents a higher degree of export diversification. Three-digit SITC export data from the United Nations database (COMTRADE) is again used to construct this index. Figure 4 shows that, in 1965 the index had an initial value of 0.45, which has been historically declining ever since as Costa Rica has diversified its economy. This downward trend accelerated after the mid 1980s, and it was only interrupted by a temporary increase in export concentration in the late 1990s - which coincided with the beginning of Intel operations in Costa Rica in 1997. Nevertheless, a few years later the index continued its declining pattern as the inflow of new foreign capital and export diversification policies continued, and in 2006 the index reached a value close to 0.23.

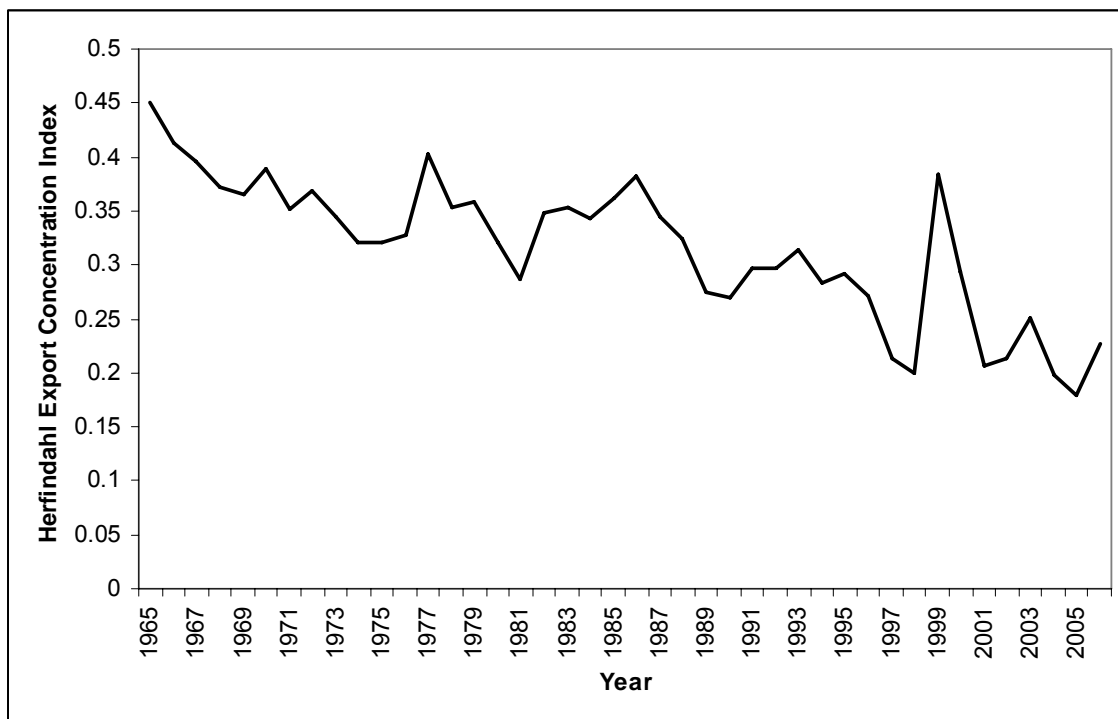


Figure 4: Herfindahl Export Concentration Index (1965 -2006).
Source: COMTRADE

Finally, the term “nontraditional export” is often used in this paper because of its close association with export diversification. Thus, a nontraditional export in Costa Rica is

defined as any product other than coffee, bananas, beef, sugar, and cotton that it is sold outside the Central America market.

2.3 Historical Overview

This section examines the export diversification experience in Costa Rica and divides it into three different sub-periods of time. The first sub-period began in the 1960s and ended in the late 1970s, and was marked by two major events: the adoption of the import substitution industrialization (ISI) development model; and the entry of Costa Rica into the Central American Common Market (CACM)³. The second period was characterized by an economic crisis in the early 1980s, which led to the abandonment of the ISI model and to the implementation of important structural economic reforms. The last period goes from the mid 1980s until present, and has been characterized by an acceleration of the export diversification process and large increases in foreign direct investment (FDI).

2.3.1 Period 1: Import Substitution Industrialization (1960 to 1979)

After World War II, Costa Rica was an agro-exporting economy highly dependent on the exports of a few agricultural products. Coffee and bananas alone accounted for almost 90 percent of the value of total exports, and drove economic growth through the 1960s (Mesa-Lago et al, 2000). Aware of the vulnerability of this economic model to external shocks, Costa Rican authorities began to plan a new development model that would transform the economy of the country during the 1960s and 1970s. This new strategy was based on industrialization through import substitution, in particular of consumer goods, and was implemented through high tariff rates for consumer goods, low import taxes for intermediates and capital goods, and the application of export taxes to goods in which Costa Rica had a strong comparative advantage (Cattaneo et al., 1999).

³ The CACM is an economic trade organization established on December 13 of 1960 and it included Guatemala, El Salvador, Honduras, Nicaragua and later Costa Rica.

Officially, the beginning of this industrialization period took place with the enactment of the Industrial Protection and Development Law in 1959. This law stimulated investment in the domestic industry, which resulted in years of high average annual growth rates in the industrial sector - above nine percent between 1965 and 1973 (Villasuso, 1999). Shortly after, in 1963 Costa Rica joined Guatemala, El Salvador, Honduras and Nicaragua in the Central American Common Market (CACM). The CACM represented an opportunity for Costa Rica's infant industrial sector, and it became the main destination market for its manufactured consumer products. The adoption of an ISI model and the incorporation of Costa Rica into the CACM resulted in the creation of new industries and in the increase of the share of manufactured goods to the country's exports. Textiles and shoes produced by the *maquiladoras* were amongst Costa Rica's first nontraditional manufacturing exports (Barhman et al, 1992). However, despite these early advances in both vertical and horizontal export diversification, 75 percent of the manufactured goods exported from Costa Rica to other CACM countries were produced by foreign owned firms, or by joint ventures between foreigners and Costa Rican investors (Clark, 2001). This was the first indication that export diversification in Costa Rica had not been triggered by domestic producers, but rather by foreign firms operating in the country.

The Figueres (1970-1974) and the Oduber administrations (1974-1978) distance themselves from the ISI model and supported export promotion and diversification with a new set of policies encouraging the use of local inputs, and the creation of new industries sufficiently competitive to export to world markets. As part of these efforts, a new economic and social development plan was designed for the 1972-1978 period, seeking further reduction of the nation's dependence on primary commodities, and the expansion of manufactured exports to other countries outside the CACM. In 1972, the Export Promotion Act was enacted to promote nontraditional exports through several fiscal incentives, and

Costa Rica's central bank financed a new public agency, the Costa Rican Development Corporation (CODESA). CODESA operated as a government holding company and would enter into joint ventures as a majority shareholder with private firms in order to develop important sectors of the economy (Mitchell and Pentzer, 2008). CODESA was also in charge of supporting new productive activities and the diversification of Costa Rican exports. While new policies were implemented, and new institutions created, Costa Rica managed to build a relatively good transportation infrastructure (airports, roads and ports) that facilitated trade and the integration of its economy in world markets (Villasuso, 1999).

Although the ISI model was designed to gradually replace the agricultural exporting model throughout the 1960s and early 1970s, Costa Rica's agricultural sector responded promptly to increasing competition in international markets by diversifying its production away from its traditional mainstays. Along with Guatemala, Costa Rica had been a forerunner in the Caribbean Basin in the promotion of nontraditional agricultural exports, and its early nontraditional agricultural exports included asparagus, strawberries, melons, broccoli, tomatoes, and flowers (Barhman et al., 1992). Interestingly, Mesa-Lago et al. (2000) argued that during the late 1970s and early 1980s there was a shift from the ISI model to a new model based on the promotion of nontraditional agricultural goods. In the authors' view, this explains why the share of industrial goods in total production failed to experience significant increases during this period of time. The export diversification and concentration indicators support this hypothesis. In the case of vertical export diversification, figure 3 shows little progress of the manufacturing sector from 1965 to 1997, while figure 4 shows a steady decrease in the Herfindahl Export Concentration Index during this same period. This evidence may indicate that the decrease of concentration of Costa Rican exports was caused by an increase of nontraditional agricultural exports, rather than by an increase in the exports of manufactured goods.

Overall, during this period Costa Rica experienced high rates of economic growth, with real benefits for its population in terms of education, health and economic prosperity. Initially, the ISI created a national industrial sector oriented toward the domestic and Central American markets. In the 1970s, the most representative industrial goods were fertilizers, pharmaceutical goods, clothing products, fungicides and insecticides, plastic goods, galvanized metal sheets, tires, leather products and synthetic fabrics (ECLAC, 1977b; Colburn and Patiño, 1988). During the second half of this period, Costa Rican authorities began to gradually substitute the inward economic vision for a more export oriented growth strategy. However, with the exception of the agricultural sector, progress in export diversification during these decades was rather disappointing, especially in terms of vertical export diversification. It was not until the mid-1980s, as a reaction to the economic crisis affecting the country, that export-promotion policies were successfully implemented.

2.3.2 Period 2: Debt Crisis and the Structural Reforms (1980-1983)

After years of uninterrupted economic prosperity, in the early 1980s Costa Rica experienced one of its worst economic crises. This crisis was the result of unsustainable foreign borrowing, rising oil prices and real interest rates, and unfavorable international prices (Weeks, 1985; Buttari, 1992; Gutiérrez de Piñeres et al., 2000). National production was greatly reduced in the agricultural, industrial and construction sectors, and between 1980 and 1982, the nation's GDP contracted by almost ten percent. As it can be seen in figure 1, the contraction of Costa Rica's economy was more severe than of Latin America in general. The unemployment rate reached almost ten percent, while the inflation rate reached ninety percent by 1982 (Mitchell and Pentzer, 2008). This crisis also exposed some of the weaknesses that undermined the ISI model, namely the dependence of the domestic industrial sector on imported inputs, the relatively small size of the domestic and Central American markets, and the unsustainable levels of public debt. This economic downturn did not go

unnoticed among international financial organizations. In the early 1980s the World Bank, the International Monetary Fund (IMF), and the United States Agency for International Development (USAID) began to pressure Costa Rican authorities to implement a series of structural adjustment programs. The main goal was to push for a gradual opening of the economy, further diversification of production and exports, and the reduction of government expenditures (Cattaneo et al., 1999). Interestingly, in the 1980s Costa Rica was regarded by the USAID as a testing ground for its export promotion programs that were to be later applied in other countries (Clark, 1995). In the domestic front, a national political consensus was reached over the fact that sustained economic recovery should be achieved via export promotion and an increase of inflows of foreign capital - in particular in nontraditional export products. Subsequently, in 1982 the newly elected administration began the implementation of an economic stabilization package.

The years of 1984 and 1985 can arguably be considered the takeoff point of the new and ongoing development model because of the numerous economic measures implemented during those years. In 1984, a cabinet-level Ministry of Exports (MINEX) was created to promote Costa Rican exports to new markets, simplify trade procedures, coordinate policies from other export promotion agencies, and reduce or eliminate export taxes, fees and streamlining procedures for exporting. Also in 1984, the Caribbean Basin Initiative (CBI) came into effect and was designed to spur economic revitalization in the region by giving all Central American and Caribbean countries (with the exception of Nicaragua) duty-free access to the U.S. market for most of their products. This trade measure gave comparative advantages to Costa Rican agroindustries, assembly and light manufacturing, thus stimulating exports in those sectors. One year later, the Costa Rican government began the gradual implementation of a comprehensive structural adjustment program that included measures to improve the financial environment, the launch of a trade reform program, and the creation of

several new governmental agencies. At the same time, the USAID supported and financed the creation of CINDE (*Coalición Costarricense de Iniciativas de Desarrollo*) - Costa Rican Investment Promotion Agency. One of the main goals of this non-governmental agency was the attraction of foreign firms from the electronic, medical equipment, and service sectors. In addition to that, this institution pushed legislation that created a series of new export incentives and provided technical assistance to producers of nontraditional agricultural exports. Also in 1985, another public agency, the National Investment Council, was created to assist Costa Rican firms that wanted to export their products. As the structural reforms gained momentum, when president Arias Sánchez was elected in 1986, it was declared that the main objective of his administration would be the consolidation of the economic recovery through an increase and diversification of the nation's exports (Villasuso, 1999).

In sum, in the wake of an economic crisis it became clear to policy makers that the ISI model no longer was a valid development strategy for Costa Rica. With the help of several international economic and financial organizations, important economic structural reforms were implemented, which laid the foundations of a new economic model based on export diversification and on the attraction of FDI in high-tech sectors. Some of its positive outcomes would be visible throughout the 1990s and 2000s.

2.3.3 Period 3: Foreign Direct Investment and Export Diversification (1984-2006)

From 1983 to the early-1990s, a nontraditional export promotion program took off with heavy economic assistance from the United States, and the leading products were textile products, fresh and frozen fish and shrimp, flowers, ornamental plants and foliage, and fresh pineapple (Clark, 1995, Clark 2001). As table 2 shows, following the structural reforms, nontraditional exports grew faster than traditional ones and in 1989 the former outperformed the latter for the first time in the nation's history.

Table 2: Costa Rica economic and export performance after the structural reforms

	1983	1984	1985	1986	1987	1988	1989	1990
Annual growth rate in real GDP (%)	2.9	8.0	0.7	5.5	4.9	3.5	5.6	3.5
Annual growth in exports (%)	-1.0	14.0	-3.5	15.8	2.0	7.0	12.8	4.5
Exports	852	971	937	1085	1107	1184	1336	1396
Traditional exports* (US\$ million)	526	597	591	690	641	604	621	593
Nontraditional exports (US\$ million)	326	374	346	395	466	580	715	803

Source: U.S. Agency for International Development based on official statistics.

* Coffee, bananas, beef and sugar.

The nontraditional export drive sought to compensate the anti-export bias that guided the nation's commercial policy during the import substitution era. Consequently, Costa Rica export supply went through most important changes, and today it is exporting goods and services significantly more sophisticated and knowledge-intensive (De Ferranti et al., 2001). During the first half of this period, several important milestones were achieved in terms of export diversification: Nontraditional exports went from 37 percent of total exports in 1981 to 60 percent in 1993; exports from the free trade zones (FTZ) surpassed coffee and bananas exports in 1996-1997; and in 1998-1999 exports of capital goods became the nation's most important generator of foreign exchange (Sánchez-Ancochea, 2006; World Bank, 2006). This transformation took place during a time in which exporters had a strong domestic political backing and benefited from a favorable policy environment. New policies were implemented and more stimuli granted to nontraditional exporters, which included exchange-rate reforms, export tax reduction, and subsidies from the government. Furthermore, three regulatory frameworks were designed to help nontraditional exporters, namely export contracts, the temporal admission regime (TAR), and the free trade zones (FTZ) regime⁴. These three regimes were considered cornerstones of the export diversification strategy and deserve a more detailed discussion.

⁴ The Law for Financial Equilibrium in the Public sector was approved by the government in 1984. Among other things, this law consolidated regulations seeking to enhance export performance.

Through export contracts, firms would receive a subsidy equivalent to a certain percentage of the value of their exports. The most important export subsidy was the *Certificado Abono Tributario* (CAT), which consisted of a tax redemption certificate negotiable on the national stock exchange. CATs were granted to nontraditional exporters for a value equivalent to a value ranging from 15 to 30 percent of the export f.o.b. value, provided that their local value added amounted to 35 percent or more. Although CATs were originally established by the Law of Industry Promotion of 1972 to help infant industries pay taxes, its use only became widespread after 1983. Almost all agricultural and agroindustrial exports, and a large number of manufactures were covered by these subsidies (Clark, 1985). Initially, the CAT program was credited as being a real help to Costa Rican exporters, with each dollar spent on them producing an increase in exports equivalent to \$1.35 (Hoffmaister, 1991:1). However, the CAT program was publicly criticized for increasing total government expenditures to unsustainable levels, for benefiting a narrow number of large firms, and for allegedly being misused to favor fraudulent export operations (Alonso, 1997). As these problems became more apparent, CATs were phased-out throughout the 1990s and gradually replaced by a new set of public policies fomenting the expansion of the FTZs to attract foreign high-tech firms. Thus, the elimination of the CAT program and the diminishing institutional support for nontraditional exporters in the mid-1990s did not disrupt the ongoing export diversification process⁵.

The other instituted regime was the Regime of Temporal Admission created in 1972, but firmly established only in 1984. The initial goal of this measure was to facilitate the establishment of *maquiladora* firms in the apparel sector (ECLAC, 2000). Under these regime, firms could operate anywhere in the country without having to pay import tariffs. However, this regime would not include income tax exceptions.

⁵ A look at the measures of export diversification and concentration shows that a short-lived deterioration around 1983 was followed by further progress.

The creation in 1981 of the FTZ regime was arguably the most important step toward the attraction of foreign firms and the promotion of new exports. According to Sánchez-Ancochea (2006), the promotion of new exports via the FTZ's has been a key policy goal in Costa Rica since the 1980s, making this nation a forerunner in their use to increase the exported amount of nontraditional goods. This regime consists of a series of incentives granted to companies that invest in areas specifically assigned by the government and that export at least 75 percent of their output (Sánchez-Ancochea, 2005). The fiscal benefits include full income tax exemptions and duty-free imports of raw materials and intermediate goods for an eight years period, and a 12 years extension with a 50 percent exemption. Finally, a ten years full exemption is granted on sales and municipal taxes. Between the 1980s and early 1990s, the production and exports from the apparel sector was a key factor in the expansion of the FTZs. However, the apparel sector failed to generate important linkages with the rest of the economy, and gradually lost its competitiveness against other developing economies. To overcome the decline of the apparel sector, in the mid-1990s CINDE began to shift its efforts from attracting apparel foreign firms to companies from the electronic, medical equipment and service sectors. As result new foreign firms established their operations in the FTZ, new nontraditional exports became the nation's top exports (i.e. electronic products, computer parts and medical devices), and the export sector became the main contributor to economic growth in Costa Rica during the 1990s.

The largest investment of foreign capital in Costa Rica was the \$300 million investment in a microprocessor plant in 1997 by Intel. This investment has been important to Costa Rica not only because of its size, but also because its indisputable impact on the nation's economy and export supply⁶. At a macroeconomic level, Intel has lead to higher rates of economic growth, helped to reverse the drop in the country's terms of trade due to

⁶ For excellent discussions about the effect that Intel has had on Costa Rica's economy see Larrain et al. (2000) and the World Bank (2006).

low world prices of its most traditional exports, and was responsible for surplus in Costa Rica's trade balance - the first surpluses in 50 years (World Bank, 2006). Intel has also been directly and indirectly responsible for the shift in Costa Rica's top exports from coffee and bananas to electric and electronic products. Firstly, given its sheer production capacity, Intel has impacted the volume and composition of Costa Rican exports, and in the year 2000 computer parts alone accounted for almost 40 percent of total exports. Secondly, the size of this investment has had a subsequent "signaling" effect on other potential investors, and CINDE used this "stamp of approval" to launch an aggressive campaign to attract other electronic manufacturers (Rodríguez-Clare, 2001). A visual analysis of figure 2 reveals that, following the beginning of Intel operations in 1997, the share of manufactures exports to total exports increased from the less than 30 percent to almost 70 percent. The already incipient Costa Rican electronic sector continued its expansion in the wake of Intel arrival, and nowadays the electronic cluster consists mainly of foreign firms and it became the nation's largest export sector. Another important contribution of Intel to Costa Rica's economy was the diversification of Costa Rica trade patterns by expanding the array of nations with which it trades as well as the number of goods being traded. Finally, Intel has had a positive impact in education through improvements in local human capital and training externalities (Larrain, et al., 2000). The export diversification effort continued throughout the second half of this period with the implementation of further measures and the creation of new institutions. Consequently, the number of export companies continued to increase as Figure 5 shows. In 1996 the *Promotora del Comercio Exterior de Costa Rica* (PROCOMER) was created to assist local firms that wanted to export their products. More specifically, PROCOMER has been providing several services such as the participation in international fairs, the organization of business and trade missions, the maintenance of the "Market Place Costa Rica" website, etc. (Martínez et al., 2008). Also in 1996, the export contracts and the TAR

were replaced by two new regimes: the *Régimen Devolutivo de Derechos* and the *Régimen de Perfeccionamiento Activo*. These two new regimes grant firms tax exemption without the issuing of redemption certificates (ECLAC, 2000). Since 1997, the Ministry of Foreign Trade (COMEX) has been working closely with CINDE for FDI attraction and with PROCOMER for export promotion.

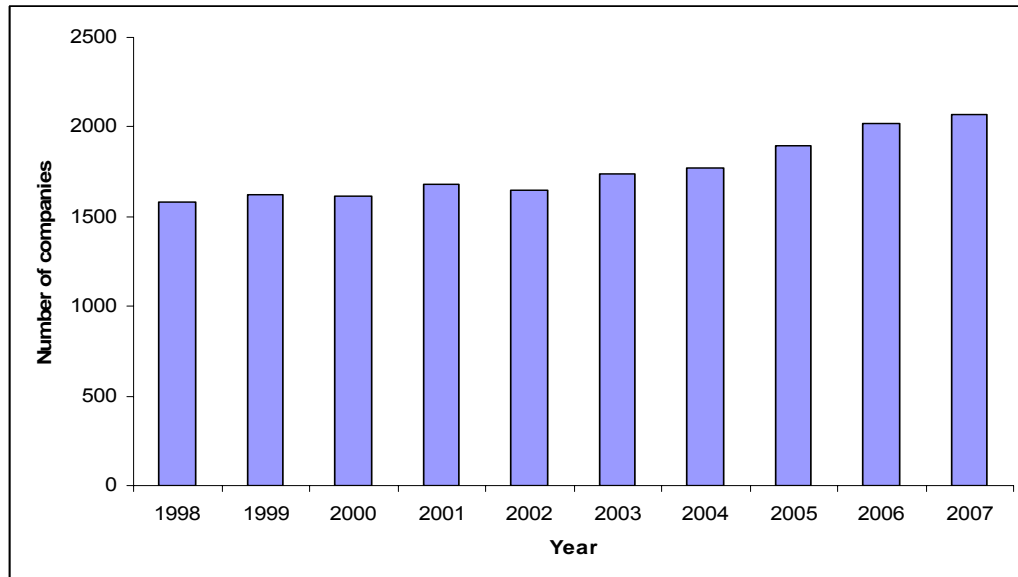


Figure 5. Number of export companies in Costa Rica (1998-2007).
Source: PROCOMER

Despite the fact that the most visible progress in export diversification have been in the manufacturing sector, Costa Rican agriculture and service sectors also went through major changes during the last two decades. The diversification and vertical integration of Costa Rica's agricultural sector was heavily subsidized by the CAT program, and it was symbolized by an increase of the numbers of high-tech agricultural producers that created new competitive advantages in nontraditional goods such as pineapples and palm hearts (Horkan, 1996). New local agroindustries began to produce higher value exports, and a study of the agro-export services in Central America revealed that in 1998 Costa Rica was the country with the most advanced private agricultural services (Pomareda and Villasuso, 1998). Example of these new industries were peeling, drying and roasting-vacuum packed coffee,

packing of fruits and vegetables, seafood, the milling of rice and sugar cane, orange juice concentrated, slaughtering of cattle, and the processing of chickens.

The service sector in Costa Rica also went through a major transformation with the number of service companies in FTZ steadily increasing from 15 in 1997 to 44 in 2005, and several international corporations locating their call centers in Costa Rica. Currently, these firms account for 26 percent of all companies located in FTZ and hire 29 percent of all workers employed there. Finally, the exports from the service sector increased from 75 millions dollars in 1997 to 171 millions in 2005 (Martínez et al., 2008).

Overall, a series of well designed public policies coupled with the increase of FDI have generated export growth and export diversification in the last two decades. These progresses are visible in all measures of export diversification and concentration computed in this study. However, it also became apparent that export diversification in Costa Rica has been directly dependent on the establishment of foreign firms in the FTZ.

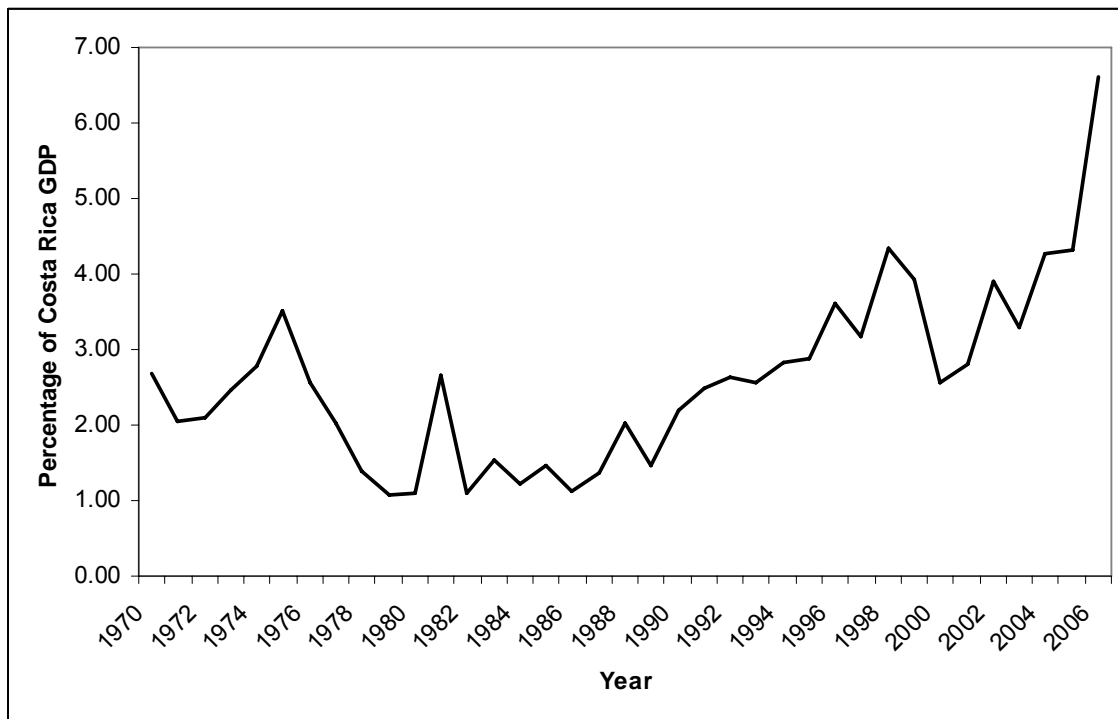


Figure 6: Foreign Direct Investment as a percentage of Costa Rica GDP (1970 – 2007).
Source: World Development Indicators, World Bank (2008).

Figure 6 shows the ratio of FDI to Costa Rica's GDP and a steady increase of this measure can be observed since the structural reforms applied in the 1980s. This increase in FDI was only interrupted around the year of 2000 due to an economic recession that affected the United States and other major industrialized nations. However, a few years later the volume of FDI in Costa Rica continued its upward trend, and actually accelerated in more recent years. Today, multinational firms operating in the FTZs are the nation's main exporters surpassing Costa Rican firms, which remain more oriented toward the domestic and Central American markets.

2.4 Discussion and Concluding Remarks

For almost two decades, the ISI in Costa Rica created a domestic industrial sector, and the nation experienced a period of high rates of economic growth. However, this inward model of development proved inadequate to overcome the challenges posed by a severe economic crisis in the early 1980s. Consequently, a national consensus was reached that the country should foster exports of high-value added manufactured goods and gain competitive advantages in the industrial sector in order to achieve again sustainable long-term growth. Today, Costa Rica's major source of export income is technology based, however Cattaneo et al. (1999) argue that the results of the structural reforms were rather ambivalent. Despite the diversification of production and export activities and the improvements in the national financial system, overall economic growth never reached the levels of the ISI years. As it can be seen in table 3, the average rate of economic growth was higher during the ISI period than in the recent decades. On the other hand, more diversified productive and export sectors were likely responsible for the slight reduction in economic volatility in recent years⁷.

⁷ Economic volatility was calculated using the standard deviations for each period.

Table 3: Average rate of economic growth and volatility of the economic growth rate in Costa

Average			Volatility (standard deviations)		
1965-1979	1980-1983	1984-2007	1965-1979	1980-1983	1984-2007
6.15	-1.48	5.02	2.55	4.4	2.45

Source: Authors' own calculation

According to Vos et al. (2006), once the production from the export-processing regimes is excluded, a more modest economic performance is revealed, and the authors explain that this in part explained by the low levels of linkages between the export enclaves and the rest of the economy. Another key challenge that Costa Rican policy makers need to address is the nation historical dependence on the United States. Several studies have shown that overall economic growth in Costa Rica is significantly dependent on the economic performance of the United States. This dependence is even more evident in the export sector given that, the United States has been historically the leading market of Costa Rican exports, and that a large number of multinational firms operating in the FTZ are from the United States.

In sum, and based on the proposed measures of export diversification and export concentration, Costa Rica has been successful in moving its economy away from its commodity dependence. However, the adopted FDI-based export diversification strategy has its own shortcomings that include weak linkages between multinational corporations operating in FTZs and the rest of the Costa Rica's economy. Furthermore, even though Costa Rica produces and exports a much larger array of products today than it did decades ago, this economy continues to depend heavily on one destination market, the United States. If Costa Rica is to remain competitive in a globalized economy, new economic policies are necessary to fully reap the benefits from the presence of high-tech firms in the country. Thus, Costa Rican authorities should continue its export-oriented economic policies, but at the same time provide additional support to the creation of small and medium domestic export-oriented firms, and improve the access of Costa Rican exports to new markets.

2.5 References

- Alonso, E J. (1997). *Promoción de exportaciones: Una revisión de las políticas actuales*. San José, Costa Rica.
- Barham, B. Clark, M., Katz, E. and Schuman, R. (1992) Nontraditional Agricultural Exports in Latin America, *Latin American Research Review*, Vol. 27, No. 2, 43-82.
- Buttari, J. J. (1992). Economic policy reform in four Central American countries: patterns and lessons learned. *Journal of Interamerican Studies and World Affairs*, Vol. 34, No. 1.
- Cattaneo, A., Hinojosa-Ojeda, R., Robinson, S. (1999) Costa Rica Trade Liberalization, Fiscal Imbalances, and Macroeconomic Policy: A Computable General Equilibrium Model, *North American Journal of Economics and Finance*, 10, 39-67.
- Clark, M. A. (1995). Nontraditional export promotion in Costa Rica: Sustaining export-led growth. *Journal of Interamerican Studies and World Affairs*, Vol. 37, No.2 (Summer, 1995) pp. 181-223.
- Clark, M. (2001). *Gradual Economic Reform in Latin America: The Costa Rican Experience*. Albany, NY: State University of New York Press.
- Colburn, F. D. and Patiño, I. S. (1988). El impulso a las ventas externas no tradicionales de Costa Rica. *Comercio Exterior* (Mexico) 38, no. 11 (November): 1027-32.
- De Ferranti, D., Lederman, D., Malloney, W. and Perry, G. (2001). *From natural resources to the new economy*. Washington D.C.: World Bank.
- Economic Commission for Latin America and the Caribbean (1977-96b). *Statistical Yearbook for Latin America 1976 to 1995*. Santiago, Chile.
- Economic Commission for Latin America and the Caribbean (2000). The fiscal impact of trade liberalization and commodity price fluctuation: The case of Costa Rica, 1980-1998. Santiago, Chile.
- Gutiérrez-de-Piñeres, S. A. and Ferrantino, M. (2000). Export dynamics and economic growth in Latin America: a comparative perspective. Ashgate Publishing, 2000.
- Gutiérrez-de-Piñeres, S. A. and Ferrantino, M. (1997). Export diversification and structural dynamics in the growth process: the case of Chile, *Journal of Development Economics*, 52, 375-391.
- Herzer, and Nowak-Lehmann (2000) What does Export Diversification do for Growth? An Econometric Analysis, *Applied Economics*, 38, 1825-1838.
- Hoffmaister, A. (1991). The cost of export subsidies: Evidence from Costa Rica. IMF Working Paper, WP/91/94. Washington DC: International Monetary Fund.
- Horkan, M.K. (1996). The benefits and costs of nontraditional agricultural export promotion in Costa Rica. Academia de Centroamérica, San José, Costa Rica.

- Larrain, F. B., Lopez-Calva, L. F. and Rodriguez-Clare, A. (2000). Intel: a case study of foreign direct investment in Central America. Center for International Development at Harvard University working paper No. 58.
- Martínez, J.M., Padilla, R. and Schatan, C. (2008). Comercio Internacional: de bienes y servicios. Los casos de Costa Rica y México. Serie Estudios y Perspectivas 97, United Nations CEPAL, Mexico D.F.
- Matthee and Naudé (2007) Export Diversity and Regional Growth: Empirical Evidence from South Africa, Research Paper No. 2007/11, United Nations University – World Institute for Development Economics Research.
- Mesa-Lago, C., Arenas de Mesa, A., Brenes, I., Montecinos, V. and Samara, M. (2000) Market, Socialist and Mixed Economies: Comparative Policy and Performance - Chile, Cuba and Costa Rica.
- Mitchell, M. T. and Pentzer, S. (2008). Costa Rica: a global studies handbook. ABC-CLIO Inc.
- Pomareda, C. and Villasuso, J.M. 1998. *Los servicios para la agroexportación en Centroamérica. Proyecto RUTA, Banco Mundial*. San José, Costa Rica.
- Rodríguez-Clare, A. (2001). Costa Rica's development strategy based on human capital and technology: how it got there, the impact of Intel, and lessons for other countries, *Journal of Human Development*, Vol. 2, No.2, pag. 311-324.
- Sánchez-Ancochea, D. (2006). Development trajectories and new comparative advantages: Costa Rica and the Dominican Republic, *World Development*, 34, No.6, 996-1015.
- Sánchez-Ancochea, D. (2005) Inversión Extranjera y Exportaciones. Un Análisis del Éxito Exportador de Costa Rica. Ensayo sobre Economía Latinoamericana para Jóvenes Investigadores December 2005 <http://www.cesla.com/analisis/archivos/PubEns2.pdf>
- Taylor, T. (2007) Export Diversification in Latin America and the Caribbean, *Farm & Business: The Journal of the Caribbean Agro-Economic Society (CAES)*, 7(1), 157-175.
- Villasuso, J. (1999) Economía Política de las Reformas Estructurales en Costa Rica, Simposio Internacional del Proyecto de Investigación: "Reforma Económica y Cambio Social en América Latina y el Caribe."
- Vos, R., Ganuza, E., Morley, S., Robinson, S. (2006). Who gains from free? Export-led growth, inequality and poverty in Latin America. London; New York: Routledge.
- Weeks, J. (1985). The economies of Central America. Publisher: Holmes & Meier:New York.
- World Bank (2006). The impact of Intel in Costa Rica: Nine years after the investment. Washington D.C.: World Bank.

CHAPTER 3: FROM COFFEE BEANS TO MICROCHIPS: EXPORT DIVERSIFICATION AND ECONOMIC GROWTH IN COSTA RICA

3.1 Introduction

Costa Rica is an interesting case study not only because of its long democratic tradition and relative economic stability, but also because the economy of this small nation has evolved from being heavily reliant on exports of coffee and bananas exports to become the largest software exporter per capita in Latin America. As the World Bank states "...it has evolved from the production of its "golden bean" (high quality coffee beans) to the "Golden chip" (World Bank, 2006). In addition, and as a result of decades of policies with strong emphasis on providing universal education and health care to its population, Costa Rica has today a well educated labor force. According to the Heckscher-Ohlin trade model, given Costa Rica's endowment of a well-educated workforce, this country has a comparative advantage in the production of knowledge-intensive goods. Well aware of this, Costa Rican authorities have been playing a very active role in the diversification of the nation's economic activities and in the attraction of investments from high-tech multinational firms.

Another important characteristic of Costa Rica is the small size of its domestic market, which limits the capability of sustained growth in its Gross Domestic Product (GDP). Moreover, a small domestic market reduces the chances of producing certain goods that are subject to economies of scale. The growth of exports and export diversification could be the solution to these constraints, and may be the reason why international trade and exports have played such an important role in the economy of this country.

This paper seeks to test the hypothesis that both vertical and horizontal export diversification has positively influenced economic growth in Costa Rica via externalities of learning-by-exporting and learning-by-doing. This hypothesis is tested using two econometric procedures, an autoregressive distributed lags (ARDL) model and a dynamic OLS (DOLS) model.

This paper is organized as follows: Section 2 discusses the literature on the linkages between export diversification and economic growth, and presents a brief discussion on the export diversification experience in Costa Rica. Section 3 presents the empirical model and the econometric methodology employed in this paper. Section 4 offers the empirical results, and section 5 concludes.

3.2 Review of Empirical Literature

There has been little systematic empirical research investigating the linkages between export diversification and long-term economic growth, and the literature on this issue has attempted to answer two important questions: Does export diversification have any effect on long-run economic growth? Is it possible for a country to improve its economic performance by exporting different types of goods? (Gutiérrez-de-Piñeres and Ferrantino, 2000).

“Does export diversification have any effect on long-run economic growth?”

A number of studies have presented evidence that export diversification is conducive to higher per capita income growth. The generally proposed hypothesis is that nations with more diverse economic structures are more likely to consistently sustain periods of high economic growth than nations with more concentrated export structures. Empirical growth literature has shown that income volatility has a negative impact on a nation’s economic growth. Along this line of thought, the so-called “portfolio effect” is a widely accepted argument in favor of export diversification, and has been borrowed from the finance literature. The portfolio effect is often cited as a mechanism through which export diversification can lead to higher economic growth, given that a well diversified export portfolio can reduce the instability of export earnings. This is desirable because, instability in a country’s export earnings can have unfavorable effects on domestic variables such as government revenues, investment, import capacity, and producers’ income. In his seminal paper, Love (1986) proposed that countries should avoid having a heavy concentration of its

exports on a few products because this reduces a nation's capability of partially offsetting fluctuations in some export sectors with counterfluctuations, or stability in other sectors. His findings concluded that export concentration had a positive and significant influence on instability of export earnings. Jansen (2004) demonstrated that income volatility in small economies is explained, to a great extent, by their high level of economic openness and by their lack of export diversification. Hence, these countries would benefit from further diversification of their exports. In another study, Al-Marhubi (2000) hypothesizes that instability in export earnings is a major source of economic uncertainty in many commodity-exporting nations because under an unstable domestic market investment in those nations becomes riskier. In other words, increasing instability in a nation's export earnings may discourage investments, which in turn negatively impacts economic growth. Using a cross-country sample of 91 countries for the period of 1961-88, Al-Marhubi found a positive and robust relationship between export diversification and economic growth. In his study, Hesse (2008) presents an extensive literature review on export diversification and economic growth, and estimates a simple augmented Solow growth model to investigate the relationship between export diversification and income per capita growth. His findings present strong evidence that export concentration, measured by a Herfindahl index, is detrimental to GDP per capita growth in developing countries. Feenstra and Kee (2004) studied the effects of sectoral export variety on a country's productivity, and after estimating a translog GDP function system for a sample of 34 countries for the period 1982-1997, they observed that a 10 percent increase in export variety of all industries led to a 1.3 percent increase a country productivity.

Other empirical studies have tested the positive links between export diversification and economic growth for specific regions or countries. Gutiérrez-de-Piñeres and Ferrantino, (2000) studied Latin American countries and found associations between episodes of export

diversification and rapid economic for the last 35 years. Chile, Colombia, Uruguay, El Salvador, Paraguay, Bolivia and Costa Rica are examples of countries that experienced significant diversification of its exports and a relatively strong growth performance. The results of their study show that export specialization was significantly and negatively correlated with economic growth after controlling for other common determinants of growth. Also in Latin America, Gutiérrez-de-Piñeres and Ferrantino (1999) identified examples of countries in where knowledge gained from exporting activities were later utilized by other exporters. This knowledge can take several forms such as the diffusion and awareness of export opportunities, diffusion of transportation and production technologies, and development of domestic services (i.e. insurance, banking, etc.). In the case of Colombia, export of fresh cut flowers was followed by other highly perishable goods. However, after applying cointegration and error-correction methodologies, the authors found no long run effect of export diversification on economic growth. In Chile, the export success of table grapes was later followed by the export of an array of fresh fruits. Herzer and Nowak-Lehman (2006) studied the Chilean experience and tested the hypothesis that export diversification has an impact on economic growth via externalities of learning-by-doing and learning-by-exporting. Using time series methodologies their results showed that both horizontal and vertical export diversification have positively influenced economic growth. At the regional level, Matthee and Naudé (2007) found that South African regions with more diversified export supplies experienced higher economic growth rates and contributed more to the nation's overall exports. Furthermore, it was horizontal diversification, and not vertical diversification per se, that was associated with higher economic growth. In other words, an increase in the range of products exported had a positive effect on growth.

“Is it possible for a country to improve its economic performance by exporting different types of goods?”

Several studies have attempted to answer this question by testing the hypothesis that the exports of certain products have different effects on a nation's economic growth. Greenaway et al. (1999) disaggregated exports into key components based on the argument that different components have different effects on GDP growth. Their findings suggest that not only export growth is an important driver of economic growth, but also corroborate the widely held view that the manufacturing sector produces larger externalities than other economic sectors. These externalities are important in the sense that they may result in further horizontal diversification and improvements in the ability of all industries to compete internationally (Matthee and Naudé, 2007).

The ratio of manufactures export to total exports is a good indicator of the degree to which an economy managed to develop forward linkages and reduced its dependence on the primary sector. Levin and Raut (1997) concluded that an increase in the ratio of manufactured exports to total export has a positive and significant impact on economic growth, whereas a growth of the primary export share has a negligible effect. In another paper, Fosu (1990) tested the effect of manufactured exports on growth comparatively to primary sector export and concluded that, in developing countries the export from the manufacturing sector has a positive impact in the economy. In another study, Moreno-Brid and Pérez (2003) studied the role that the external sector has played on the long-run rate of economic growth of three Central American countries: Costa Rica, El Salvador and Guatemala. In the case of Costa Rica, the shift from exports of primary commodities to more manufacturing/high-technology goods was found to increase the income-elasticity of its exports. Finally, Balaguer and Cantavella-Jordá (2004) demonstrated that the structural transformation in export composition that took place in Spain was a key factor in the nation's economic development. In addition, their findings lend support to the idea that allocation of resources towards more industrialized export sectors had a positive impact on the economy.

In sum, the existing body of literature on this topic is still limited, and the discussion on how export diversification affects economic growth is by no means closed. Empirical studies showing long-run relationships between vertical and/or horizontal export diversification and economic growth are limited to a few cross-country and country level studies, warranting further study.

3.3 Overview of Costa Rica's Export Diversification Experience

Until the second half of the twentieth century, Costa Rica was characterized as being an agro-exporting economy highly dependent on the export of few agricultural products. Coffee and bananas alone accounted for almost 90 percent of the value of total exports, and drove economic growth through the 1960s (Mesa-Lago et al., 2000). Aware of the vulnerability of this commodity-export model to external shocks, Costa Rican authorities implemented a new development strategy that would lead the country through an economic transition during the 1960s and 1970s. The country veered toward a model of development based on industrialization through import substitution, in particular of consumer goods. For that, Costa Rica imposed high tariff rates for consumer goods, and maintained low import taxes for intermediates and capital goods. In addition, export taxes were applied on those goods in which Costa Rica had a strong comparative advantage (Cattaneo et al., 1999).

The import substitution industrialization (ISI) strategy was relatively successful in creating a domestic industrial sector and resulted in high rates of economic growth for more than two decades. However, in the beginning of the 1980s, Costa Rica went through its worst economic crisis since World War II that evidenced some of the shortcomings of the ISI model. With the support of international financial and development organizations, Costa Rica adopted new policies of development that would include export promotion and export diversification. This new economic outward orientation secured a wide consensus among Costa Rican policy makers, and important structural reforms were implemented throughout

the 1980s. As part of this new export-led model, Costa Rica authorities successfully created free trade zones (FTZ) regimes in where fiscal and economic incentives were granted to those firms that would locate their operations. This policy was arguably the most important step toward the promotion of new exports and attraction of foreign firms. The FTZs coupled with Costa Rica's relatively educated populated, political stability, and a series of pro-investment public policies allowed the country to become an important offshore manufacturing and customer service for a number of multinational corporations. Nevertheless, despite the increase in nontraditional exports attributed to the establishment of FTZs, Mitchell and Pentzer (2008) observes that most exporting firms there located are large foreign companies that were able to take advantage of the incentives offered by the Costa Rican authorities. The most representative example of this is was the decision of Intel to invest in a microprocessor plant in Costa Rica in 1997, with an indisputable impact on the national economy¹.

In sum, the implementation of these export promotion and export diversification policies during the second half of the 1980s, and throughout 1990s transformed Costa Rica's export supply. The share of manufactured exports to total exports increased substantially, and for the 1992 to 2000 period these exports became the main contributor to economic growth. At the same time Costa Rica managed to reduce its dependency on the exports of few primary goods, and has now a flourishing high-tech and medical equipment manufacturing export sectors as well as diversified agricultural and service sectors.

3.4 Theoretical Model and Data

3.4.1 The Model

This section presents a generalization of the model proposed by Herzer and Nowak-Lehmann's (2006) to test the hypothesis that export diversification has influenced economic growth in Costa Rica via externalities of learning-by-exporting and learning-by-doing.

¹ For good discussions on the impact that Intel has had on Costa Rica's economy see Larrain *et al* (2000) and World Bank (2006).

The model assumes the economy is composed of a total of n sectors from which S are export sectors, thus $S \in n$. It is also assumed that there is only one firm in each sector, and that at a given point in time t the production function of each sector $f \in [1, n]$ is characterized by a neoclassical production function:

$$Y_{ft} = F_{ft}(K_{ft}, L_{ft}, P_t) \quad (1)$$

where Y_{ft} is the output of a sector, while K_{ft} and L_{ft} are standard capital and labor inputs respectively. The input P_t corresponds to an index of public knowledge in period t , and is regarded as a positive externality in equation (1). This knowledge externality has two main properties. One is that knowledge spillovers are primarily generated by export sectors as a result of both learning-by-exporting and learning-by-doing. Learning-by-exporting arises when an export sector acquires knowledge from their foreign purchasers who share part of their know-how and offer advice on productivity enhancement. On the other hand, the basic idea behind learning-by-doing is that knowledge creation occurs as a byproduct of production and it depends on the firm's cumulative output. Hence, firms will increase their stock of knowledge as they expand their exports, and this accumulation process will accelerate as a firm exposes itself to competitive international markets.

It is assumed that each export sector S_t produces an equal amount of public knowledge p . Hence, a nation's level of aggregated knowledge is given by the following equation

$$P_t = S_t p_t \quad (2)$$

Given that p_t is not directly observable and it is assumed as a constant parameter, the level of knowledge in the economy can be expressed instead as a function of the number export sectors without including p_t

$$P_t = Z(S)_t \quad (3)$$

In their study, Herzer and Nowak-Lehmann assumed that primary goods tend to have a lower potential for learning-by-doing and learning-by-exporting comparatively to

manufactured goods. Consequently, they hypothesized that the pace of knowledge creation in the economy will increase with increases in the share of manufactured products in total exports. Based upon this premise a new knowledge equation can take the following form

$$P_t = Z(S_t, MX_t) \quad (4)$$

where the share of manufactured products in total exports (MX_t), and the number of export sectors (S_t) are used as proxies for the stock of knowledge in the economy.

The second main property of this model is that the level of aggregated knowledge P_t is considered a public good and constant within all sectors. It is assumed that P_t affects all sectors equally but how P_t affects the function F_f is neglected by the export sector. By treating P_t as a given, the production function F_{ft} has constant-returns-to-scale. It is also assumed that all firms operate in perfect competition and are price takers. Next, the components of the production function are set

$$Y_t = \sum_{f=1}^n Y_{ft}, \quad K_t = \sum_{f=1}^n K_{ft}, \quad L_t = \sum_{f=1}^n L_{ft} \quad (5)$$

Now, Y_t can be rewritten as function

$$Y_t = \sum_{f=1}^n Y_{ft} = F_t(K_t, L_t, P_t) \quad (6)$$

Equation (7) is obtained by inserting the public knowledge parameter of equation (4) into the production function. Equation (7) is then expressed as a Cobb-Douglas production

$$Y_t = F_t(K_t, L_t)(S_t, MX_t) = K_t^\beta L_t^\delta S_t^\psi MX_t^\gamma \quad (7)$$

where K_t and L_t represent the stock of accumulated capital and labor force of the economy respectively, and the parameters β , δ , ψ and γ are constants. By adding the number of export sectors and the share of manufactured exports as explanatory variables to equation (7), it is implied that both horizontal and vertical export diversification influence economic growth via externalities of learning-by-doing and learning-by-exporting. That is, ψ and γ are greater than zero.

To empirically test the long-run relationship between growth and export diversification equation (7) is transformed into a log-linear regression form

$$\ln Y_t = \alpha + \beta \ln K_t + \delta \ln L_t + \psi \ln S_t + \gamma \ln MX_t + \mu_t \quad (8)$$

where \ln is the natural logarithm of the variables, and the estimates of β , λ , ψ , and γ represent elasticities. The error term μ_t is assumed to be white-noise normally and identically distributed. Equation (8) will be subject to empirical scrutiny, and this model will be used to test the diversification-led growth hypothesis for the manufacturing sector:

$$H_0: \quad \psi, \gamma = 0$$

$$H_1: \quad \psi, \gamma > 0$$

Accordingly, it is hypothesized that the estimates of ψ , γ are both positive and statistically significant, thus confirming the diversification-led growth.

3.4.2 The Data

To estimate equation (8) annual data for the period of 1965 to 2006 is used for all variables. S_t represents the number of export sectors classified by the Standard International Trade Classification (SITC) at the three-digit level, and has been gathered from the United Nations dataset (COMTRADE). The data for the remaining variables is from the 2008 World Development Indicators online version. Firstly, Y_t represents Costa Rica's real gross domestic product, while K_t represents gross fixed capital formation and it is used as a proxy for capital accumulation. These two variables are measured in inflation-adjusted U.S. dollars and the year 2000 is used as the base year. The series L_t corresponds to Costa Rica's total labor force given by the economically active population (EAP). The EAP comprises persons of either sex above a specified age who furnish the supply of labor for the production of economic goods and services. Finally, MX_t corresponds to the share of manufactured exports to total exports and it is expressed in percentages. Complete variable definitions and data sources are provided in Appendix 2.

3.5 Econometric Methodology

3.5.1 Test for Univariate Integration

To undertake this empirical analysis, the first step is to examine the time series properties of all the variables in logarithmic terms. A visual inspection of all variables in levels suggests that they are trending, and therefore are nonstationary. That is, their variances and covariances are not finite or independent of time.

The sample autocorrelation functions (ACF) and the partial autocorrelation functions (PACF) provide further evidence that the series are not stationary in levels and may contain unit roots. As econometric theory shows, when variables are nonstationary the standard ordinary least squares (OLS) model cannot be applied and there might be a spurious regression. Spurious regressions are normally characterized by having a high R^2 and statistically significant t-statistics; however, their results have no economic meaning (Granger and Newbold, 1974). The stationarity of the series is first investigated by applying the augmented Dickey-Fuller unit root test (ADF) and the Phillips and Perron (1988) test (PP). However, recent studies have found that these standard unit root tests tend to perform poorly in the presence of small samples as the one used in this paper. In addition, these tests suffer from a well-known weakness when testing stationarity of a series that exhibits a structural break. More specifically, they tend to identify a structural break in the series as evidence of nonstationarity, and thus fail to reject the null hypothesis. To deal with this problem, a number of methods were developed to improve the statistical tests in the presence of structural breaks. The Zivot and Andrews (1992) (ZA) and the Perron and Vogelsang (1992) (PV) unit root tests are undertaken in this study, because both procedures allow for formal evaluation of the time series properties in the presence of a structural break at an unknown point in time. The results from the four unit root tests will be compared so that valid conclusions can be drawn on the order of integration of the variables in the model.

3.5.2 Test for Multivariate Cointegration (ARDL)

Before testing the proposed empirical model, a brief discussion of the ARDL approach to cointegration is presented. The choice of this methodology over other alternatives is based on several considerations. Firstly, the Johansen procedure allows for testing for the absence of a long-run relationship under the restrictive assumption that all the model's variables are integrated of order one. However, and as shown at Pesaran and Shin (1995) and Pesaran et al. (2001), the ARDL models yield consistent estimates of the long run coefficients that are asymptotically normal irrespective of whether the underlying regressors are purely I(0), purely I(1) or fractionally cointegrated. Additionally, because of the low power of unit root tests there is always a certain degree of uncertainty regarding the order of integration of the underlying variables. The bounds testing procedure circumvents these two problems. Secondly, the ARDL methodology provides unbiased estimates of the long-run model and valid t-statistics by the inclusion of dynamics in the model, even when some of the regressors are endogenous (Inder, 1993). This is advisable for this model because of potential endogeneity of the export diversification variables due to potential linkages with the inflows of FDI in Costa Rica. Lastly, when compared to other alternative techniques, this methodology performs better with small samples like the one in this study.

To conduct the bounds test, equation (8) is converted into an unrestricted error correction model (UECM) form represented by equation (9)

$$\begin{aligned} \Delta \ln Y_t = & \alpha + \sum_{k=1}^n \delta_1 \Delta \ln Y_{t-k} + \sum_{k=0}^n \delta_2 \Delta \ln K_{t-k} + \sum_{k=0}^n \delta_3 \Delta \ln L_{t-k} \\ & + \sum_{k=0}^n \delta_4 \Delta \ln S_{t-k} + \sum_{k=0}^n \delta_5 \Delta \ln MX_{t-k} + \beta \ln K_{t-1} + \delta \ln L_{t-1} \\ & + \psi \ln S_{t-1} + \gamma \ln MX_{t-1} + \varepsilon_t \end{aligned} \quad (9)$$

Where α is the drift component, Δ represents the first differences, and ε_t are white noise errors uncorrelated with the variables in right-hand side of the equation. In this setup,

the short-run effects are inferred by the sign and significance of the estimates of δ_1 , δ_2 , δ_3 , δ_4 , and δ_5 . The long-run effects are inferred by the sign and significance of the estimates of β , δ , ψ and γ . Because all the variables in the model appear to be trended, a second ARDL-UECM including a trend term t is estimated.

$$\begin{aligned}\Delta \ln Y_t = & \alpha + \xi_t + \sum_{k=1}^n \delta_1 \Delta \ln Y_{t-k} + \sum_{k=0}^n \delta_2 \Delta \ln K_{t-k} + \sum_{k=0}^n \delta_3 \ln L_{t-k} \\ & + \sum_{k=0}^n \delta_4 \Delta \ln S_{t-k} + \sum_{k=0}^n \delta_5 \Delta \ln MX_{t-k} + \beta \ln K_{t-1} + \delta \ln L_{t-1} \\ & + \psi \ln S_{t-1} + \gamma \ln MX_{t-1} + \xi_t\end{aligned}\quad (10)$$

The implementation of the ARDL approach to cointegration procedure requires two steps. The first step involves estimating equations (9) and (10) using OLS, and the second step includes tracing the presence of cointegration among the variables by restricting all estimated coefficients of lagged level variables so that the inclusion of the lagged level of variables is warranted. Thus, the null hypothesis of no cointegration ($H_0 = \beta = \delta = \psi = \gamma = 0$) is tested against the alternative ($H_1: \beta \neq \delta \neq \psi \neq \gamma \neq 0$) using the familiar F -test with critical values tabulated by Pesaran et al. (2001). Two asymptotic critical value bounds provide a test for cointegration when the dependent variables are $I(d)$ with $0 \leq d \leq 1$. The upper bound assumes all variables are $I(1)$ while the lower bound assumes that all the variables are $I(0)$. If the computed F -statistics exceed their respective upper critical values, the null hypothesis of no cointegration is rejected. If the test statistics fall below the lower critical values, the null hypothesis cannot be rejected. If the statistics fall within their respective bounds, inference would be inconclusive and the order of integration of the underlying variables has to be investigated more deeply.

3.5.3 Estimation of Long-Run Elasticities: Stock-Watson Dynamic OLS

Stock and Watson (1993) developed a powerful and practically convenient modeling procedure known as Dynamic OLS (DOLS). Several arguments that validate its use in the

present study are now presented. Firstly, evidence from Monte Carlo simulations has shown how estimators from this procedure are superior to a number of alternative estimators of long-run parameters, including those proposed by Engle and Granger (1987), Johansen (1988) and Phillips and Hansen (1990). Moreover, DOLS allows for variables of different integration order, it tackles for any possible simultaneity bias within regressors, and it guarantees valid estimations even in the presence of endogenous independent variables. Finally, DOLS is asymptotically equivalent to Johansen's maximum likelihood estimator, but it tends to perform well with small samples like the one in this study.

The DOLS procedure involves regressing any $I(1)$ variable on other $I(1)$ variables, on $I(0)$ variables and on the leads and lags of the first differences of any $I(1)$ variables. The final equation of DOLS model is presented in the following section of the paper, and it is constructed based on the results from the unit root tests for each series.

3.6 Empirical Results

3.6.1 Tests for Unit Roots

Given that all variables exhibit upward trends overtime, the ADF and PP tests were undertaken with and without the inclusion of a deterministic trend. Table 4 reports the ADF and the PP test statistics for the log levels and first differences of all variables. The results from both tests indicate that the null hypothesis of a unit root cannot be rejected for all variables in levels, with the exception of the number of export sectors variable, which is trend stationary in levels. When the tests were computed using first-differenced data, the null hypothesis was strongly rejected in all cases. In sum, the results from these two unit root tests suggest that all variables, with the exemption of S_t , are $I(1)$ in levels but $I(0)$ in first differences. Despite the consistency of the results of these two tests, one needs to be cautious in interpreting them.

Table 4. Augmented Dickey-Fuller and Phillips-Perron tests for unit roots

Variable	Augmented Dickey-Fuller		Phillips-Perron		Result
	Z(t)df	Z(t*)df	Z(t)pp	Z(t*)pp	
Levels					
LYt	-0.95	-2.02	-0.84	-2.282	
LLt	-0.85	-2.22	-1.12	-2.058	
LKt	-0.425	-1.99	-0.52	-1.9	
LSt	-2.17	-4.20**	-2.17	-4.17**	$I(0)+$ trend
LMXt	-0.61	-1.69	-0.71	-1.9	
First differences					
Δ LYt	-3.78***	-3.69**	-3.72***	-3.62**	$I(1)$
Δ LLt	-7.72***	7.74***	-7.98***	-8.08***	$I(1)$
Δ LKt	-5.27***	-5.19***	-5.25***	-5.18***	$I(1)$
Δ LSt	-7.47***	-7.46***	-7.81***	-7.79***	$I(0)+$ trend
Δ LMXt	-5.34***	-5.32***	-5.31***	-5.27***	$I(1)$

Note: Z(t)df is the ADF test allowing for a drift term, whereas Z(t*)df is the ADF test allowing for a drift and a deterministic trend. Z(t)pp is the PP test allowing for a drift term, whereas Z(t*)df is the PP test allowing for a drift and a deterministic trend. *, **, *** denote the rejection of the null hypothesis of a unit root at 10%, 5% and 1% level respectively.

Literature on Costa Rica economy identifies two potential structural breaks in the last forty years. The first break occurred when a severe economic crisis affected the country between the late 1970s and early 1980s, resulting in important structural reforms in the mid-1980s. The other potential break was likely to have happened in the late-1990s when the American multinational, Intel, began its operations in Costa Rica. A visual inspection of the graphs of the variables in log levels shows that at least one of the above mentioned structural breaks may be present in the series, with the exception of labor force variable. Based on this, two further unit root tests are computed to check if in the presence of a structural break, the series are integrated of order one or otherwise.

The results in table 5 show that results from the Zivot and Andrews test suggest that, when a structural break is considered, all variables are $I(0)$ in levels with the exception for the labor force variable which becomes $I(0)$ only after being differenced. The Perron and Vogesland unit root test shows that both export diversification variables are stationary at the levels, while GDP, labor and capital variables are integrated of order one. These results

question the integration orders found by the ADF and PP unit root tests, and at the same time provide evidence that both vertical and export diversification variables are likely to be stationary in levels, while GDP, labor and capital variables are $I(1)$.

Table 5. Zivot and Andrews and Clemente, Perron and Vogelsang unit root tests with structural break

Variable	Zivot and Andrews			Perron and Vogelsang		
	Minimum t-statistic	Break year	Result	Minimum t-statistic	Break year	Result
Levels						
LYt	-4.96**	1981	$I(0)$	-2.34	1994	
LLt	-4.24	1991		-1.97	1989	
LKt	-5.59***	1982	$I(0)$	-2.33	1984	
LSt	-6.368***	1987	$I(0)$	-4.02**	1988	$I(0)$
LMXt	-7.221***	1997	$I(0)$	-6.41***	1995	$I(0)$
First differences						
ΔLYt				-5.82***	1980	$I(1)$
ΔLLt	-7.078***	1996	$I(1)$	-7.06***	1989	$I(1)$
ΔLKt				-5.99***	1981	$I(1)$

Note: Critical values values for the Zivot and Andrews test are taken from Zivot and Andrews(1992). Critical values values for the Perron and Vogesland test are taken from Perron and Vogesland (1992). *, **, *** denote the rejection of the null hypothesis of a unit root at 10%, 5% and 1% level respectively. The lag length used in the test for each series was determined by the Akaike's Information criterion (AIC), the Schwarz's Bayesian information criterion (SBIC), and the Hanna and Quinn

3.6.2 Multivariate Integration: ARDL

To determine the optimal number of lags to be included in the estimation of ARDL-UECM procedure, the Akaike's Information criterion (AIC), the Schwarz's Bayesian information criterion (SBIC), and the Hanna and Quinn information criterion (HQIC) were used. Nevertheless, because there was no agreement among the criterion on whether to include 1 or 2 lags, the ARDL-UECM was estimated with both order of lags. The computed F-statistics for the joint significance of lagged levels in equation (9) and (10) lags are presented in table three for each order along with the 10 percent level critical values. The results indicate that the computed F-statistics are not significant at the 10 percent level, thus the null hypothesis of no cointegrating relationships between the examined relationships

cannot be rejected, meaning no cointegration between real GDP, capital, labor and the export diversification variables.

Table 6 .Bounds test for the existence of a long-run relationship

	Lag	F-Statistic	10%Critical Bounds	
			I(0)	I(1)
ARDL with no trend	2	1.84	2.45	3.52
	1	1.43	2.45	3.52
ARDL with trend	2	3.01	3.03	4.06
	1	1.66	3.03	4.06

Note: The relevant critical value bounds are obtained from Table C1.iii (with an unrestricted intercept and no trend, with 4 regressors) and from Table C1.v (with an unrestricted intercept and unrestricted trend, with 4 regressors) in Pesaran *et al.* (2001). *,** and *** indicate significance at the 1, 5 and 10% levels.

The conclusions do not change for the ARDL model in where a trend term is included. Both results suggest the lack of a linear long-run impact of export diversification on economic growth in Costa Rica. To confirm the robustness of this finding, the DOLS procedure is applied to equation (8).

3.6.3 Long-Run Elasticities: Stock-Watson DOLS

To estimate the long-run parameters using the DOLS procedure the growth equation (8) is transformed into equation (11).

$$\begin{aligned}
 \ln Y_t = & \sigma + \beta \ln K_t + \lambda \ln L_t + \psi \ln S_t + \gamma \ln MX_t \\
 & + \sum_{k=-n}^{k=n} \zeta_1 \Delta \ln L_{t-l} + \sum_{k=-n}^{k=n} \zeta_2 \Delta \ln K_{t-k} \\
 & + du80 + d80 + \omega_t
 \end{aligned} \tag{11}$$

Given that annual data is used, the model is estimated with inclusion of $n = \pm 2$ leads and lags². A step dummy, $du80$, and an impulse $d80$ are also included in equation (11) to

² The DOLS model was also estimated using one and three leads and lags without altering the results to any significant degree,

account for the severe economic downturn that affected Costa Rica in the early 1980s³. The results in table 4 show that while capital and labor have a positive and significant effect on Costa Rica's economic growth, both vertical and horizontal export diversification do not significantly influence economic growth. The diagnostic tests presented underneath table 7 do not indicate any problems of heteroskedasticity or nonnormality of the errors however serial correlation was detected.

Table 7. Stock-Watson DOLS long-run parameter estimates

β	δ	ψ	γ
0.26*** (3.14)	0.81*** (4.38)	-0.18 -(1.11)	0.24 (0.44)

Notes:

Adj. $R^2 = 0.99$	DW = 1.03	SW = 0.96(0.15)
ARCH(1) = 0.99	ARCH(2) = 0.98	ARCH(3) = 0.99
BG(1) = 0.00	BG(2) = 0.00	BG(3) = 0.00

The parentheses under the coefficients denote t statistics. *, ** and *** indicate significance at the 10, 5 and 1% levels. BG is the Breusch-Godfrey test for higher-order serial correlation in the disturbance and ARCH is Engle's LM test for autocorrelation conditional heteroskedasticity, with $k = 1, 2$ and 3 lags. SW is the Shapiro-Wilk test for normality

Thus, equation (11) was again estimated using robust standard errors, and its results are shown in table 8. No noteworthy changes in the statistical significances of the estimated elasticities occurred. The DOLS procedure confirms the lack of a long-run causality between export diversification and economic growth in Costa Rica over the period 1965 to 2006.

³ The year of 1980 was chosen based on the literature on the economic crisis that affected Costa Rica, and on visual observation of the plots of the series in log levels. $du80$ is 1 from 1980 onwards and zero otherwise, while $d80$ has a value of 1 in 1980 and zero otherwise.

Table 8. Stock-Watson DOLS long-run parameter estimates with robust standard errors

β	δ	ψ	γ
0.26*** (4.37)	0.81*** (5.65)	-0.18 -(1.20)	0.24 (0.80)

3.7 Concluding Remarks

By estimating an augmented Cobb-Douglas production function using time series data, this study has presented empirical evidence that both vertical and horizontal diversification are not associated with faster economic growth in Costa Rica over the period of 1965 to 2006. These findings contradict those from other empirical studies that identified positive linkages between export diversification and economic growth. It is important to understand why the present results differ from those found for Chile by Herzer and Nowak-Lehmann's (2006). These two countries are regarded as successful in terms of their economic performance and diversification of their exports. However, a closer look to the latter issue reveals differences that may explain why export diversification has played an important role in the economy of Chile and not so in Costa Rica.

In the case of Chile, the most important source of export diversification has been the emergence of non-traditional agricultural exports. Examples of exported resource-based goods are those produced by forestry and mining conglomerates, a thriving wine sector, and an expanding salmon-farming industry. Although these products have low levels of technological content, they often are produced by domestic firms. On the other hand, Costa Rica went from being highly reliant on exports of few primary goods to a country with a flourishing high-tech and medical equipment manufacturing export sectors, and well diversified agricultural and service sectors. However, this was likely the result of the creation of export processing zones by Costa Rican authorities, which attracted foreign capital in

sectors with high technological contents throughout the 1990s. Such interdependence between export diversification and foreign investment by large multinationals may have posed limitations to the amount of knowledge spillovers generated by the export sectors. Consequently, Costa Rica has not been able to use its high-tech and high value-added exports to trigger a sustained process of economic growth. This corroborates the argument of Sanchez-Ancochea (2006) that although Intel and other multinational corporations operating in Costa Rica contributed to an increase in exports and generated direct employment, they failed to generate substantial linkages with the rest of the economy. In the particular case of Intel, some economists maintain that this firm has operated as an enclave, importing most of its components for its assembly, and generating a low economic multiplier (World Bank, 2006). Furthermore, despite the surge of non-traditional agricultural exports in the last decades, Costa Rica is still exporting mainly raw agricultural products with little value added (Barquero, 2006a). Finally, Mitchell and Pentzer (2008) make an important observation that despite the fact that the range of export products in Costa Rica has grown, a group of few products, including manufactured and agricultural products, continues to account for the majority of the export value. Thus, progresses made in terms of horizontal and vertical export diversification may fail to reveal a persistent concentration in terms of value. In 2005, 84 percent of the total value of all goods exported was produced by large corporations - which account only for 20 percent of the total number of manufacturers in Costa Rica (PROCOMER, 2005).

In terms of policy implications, this study presents evidence that expansion and diversification of exports per se may not be sufficient to promote economic growth, unless they lead to the creation of new productive capabilities in other sectors of the economy via knowledge externalities. Given the apparent limitations of their hitherto export-led model of development, Costa Rican authorities should design a new set of policies seeking to improve

the nation's long-term economic growth potential. Some of those new policies would include: the creation further linkages between the export sector and the rest of the economy so that new channels for knowledge spillovers may be open; to use the presence of multinational companies in the country to spur development of domestic-owned suppliers and other satellite business, and to provide additional support to the creation of small and medium domestic export-oriented firms.

3.8 References

- Al-Marhubi, F. (2000). Export diversification and growth: an empirical investigation, *Applied Economics Letters*, 7, 559-562.
- Andrews, D. and Zivot, E. (1992). Further evidence on the Great Crash, the oil price shock, and the unit-root hypothesis. *Journal of Business and Economic Statistics* 10, 251-70.
- Balaguer, J. and Cantavella-Jordá, M. (2004). Structural change in exports and economic growth: cointegration and causality analysis for Spain (1961-2000), *Applied Economics*, 36, 473-477.
- Barquero S., M. (2006a.). "Menos de 10% de ingresos por café y melón llegan al productor." *La Nación*, March 29, sec. "Economía."
- Cattaneo, A., Hinojosa-Ojeda, R.A. and Robinson, S. (1999). Costa Rica trade liberalization, fiscal imbalances, and macroeconomic policy: a computable general equilibrium model, *North American Journal of Economics and Finance*, 10, 39-67.
- Engle, R.F. and Granger, C.W.J. (1987). Cointegration and error correction: representation, estimation and testing, *Econometrica*, 55, 251-276.
- Feenstra, R., and H.L. Kee (2004) "Export Variety and Country Productivity," *NBER Working Paper* 10830, National Bureau of Economic Research: Cambridge MA.
- Fosu, K. (1990). Export composition and the impact of exports on economic growth of developing economies, *Economic Letters*, 34, 71-76.
- Granger, C.W.J. and Newbold, P. (1974). Spurious regression in econometrics, *Journal of Econometrics*, 2, 111-120.
- Greenway, D., Morgan, W., and Wright P. (1999). Exports, export composition and growth, *The Journal of International Trade & Economic Development*, 8:1, 41-51.
- Gutiérrez-de-Piñeres, S. A. and Ferrantino, M. (1999). Export sector dynamics and domestic growth: the case of Colombia, *Review of Development Economics*, 3(3), 268-280.
- Gutiérrez-de-Piñeres, S. A. and Ferrantino, M. (2000). Export Dynamics and Economic Growth in Latin America: A Comparative Perspective. Ashgate Publishing, 2000.

- Herzer, D. and Nowak-Lehmann D. F. (2006). What does export diversification do for growth? An econometric analysis, *Applied Econometrics*, 38, 1825-1838.
- Hesse, H. (2008). Export diversification and economic growth, Commission on Growth and Development Working Paper No. 21, The International Bank for Reconstruction and Development/World Bank, Washington D.C..
- Inder, B. (1993). Estimating long-run relationships in economics: a comparison of different approaches, *Journal of Econometrics*, 57, 53-68.
- Jansen, M. (2004). Income Volatility in small and developing economies: export concentration matters, WTO Discussion Papers No 3, Geneva: World Trade Organization.
- Johansen, S. (1988). Statistical analysis of cointegration vectors, *Journal of Economic Dynamics and Control*, 12, 231-254.
- Larrain, F. B., Lopez-Calva, L. F. and Rodriguez-Clare, A. (2000). Intel: a case study of foreign direct investment in Central America. Center for International Development at Harvard University working paper No. 58.
- Levin, A. and Raut, L. K. (1997). Complementarities Between Exports and Human Capital in Economic Growth: Evidence from the Semi-industrialized countries, *Economic Development and Cultural Change*, 46(1), 155-174.
- Love, J. (1986). Commodity Concentration and Export Earnings Instability, *Journal of Development Economics*, 24, 239-248.
- Matthee, M. and Naudé, W. (2007). Export diversity and regional growth: Empirical evidence from South Africa, United Nations University Research Paper No. 2007/11.
- Mesa-Lago, C., Arenas de Mesa, A. and Brenes, I. (2003). Market, Socialist, and Mixed Economies: Comparative Policy and Performance--Chile, Cuba, and Costa Rica. Johns Hopkins University Press, Baltimore, Maryland.
- Mitchell, M. T. and Pentzer, S. (2008). Costa Rica: a global studies handbook. ABC-CLIO Inc.
- Moreno-Brid, J. C. and Pérez, E. (2003). Trade liberalization and economic growth in Central America, The Economic Commission for Latin America (ECLA) Review 81, Santiago, Chile.
- Phillips, P. C. B. and Hansen, B. E. (1990). Statistical Inference in instrumental variables regression with $I(1)$ processes. *Review of Economic Studies*, 57, 99-125.
- Perron, P., Vogelsang, T. (1992). Nonstationarity and level shifts with an application to purchasing power parity, *Journal of Business and Economic Statistics*, 10, 301-320.
- Pesaran, M.H. and Shin, Y. (1995). An autoregressive distributed lag modeling approach to cointegration analysis." In Centennial Volume of Rangar Frishe (Eds.). S. Strom, A. Holly, and P. Diamond, Cambridge University Press, Cambridge.

Pesaran, M.H., Shin, Y. and Smith, R.J. (2001). Bounds testing approaches to the analysis of level relationships, *Journal of Applied Econometrics*, 16, 289-326.

Phillips, P. C., and Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika* 75, 335-346.

Promotora del Comercio Exterior de Costa Rica (PROCOMER). (2004). "Costa Rica: Estadísticas de Exportación." www.procomer.com/est/mercados/libros.cfm/.

Sanchez-Ancochea, D. (2006). Development trajectories and new comparative advantages: Costa Rica and the Dominican Republic, *World Development*, 34, No.6, 996-1015.

Stock, J. H. and Watson, M. (1993). A simple estimator of cointegrating vectors in higher order integrated systems, *Econometrica*, 61, 783-820.

World Bank (2006). The impact of Intel in Costa Rica: Nine years after the investment. Washington D.C.: World Bank.

CHAPTER 4: ON THE CAUSAL LINKS BETWEEN EXPORTS AND ECONOMIC GROWTH IN COSTA RICA

4.1 Introduction

The linkages between trade expansion and economic growth have received considerable attention from development economists over the last three decades, and a large body of literature has investigated the so-called export-led growth (ELG) hypothesis, which states that export growth is a major determinant of output growth. Nevertheless, evidence from these studies has been at best mixed and often conflicting. Hence, the ELG hypothesis remains a debated topic and further research on this issue is warranted to help governments implement more effective growth and development policies.

Many Latin America countries were affected by a severe economic crisis (the debt crisis) in the 1980s. This economic downturn exposed some the shortcomings of the import substitution industrialization (ISI) development strategy, which had been adopted by many countries in the region. Consequently, the ISI model was gradually replaced with new policies fostering economic and trade liberalization. Following this trend, Costa Rica opened its economy and began the implementation of an export-oriented development model in the mid-1980s. Because of its dynamic export sector and relatively good economic performance, this small Central American economy represents an interesting case study of the ELG hypothesis that merits a rigorous empirical analysis. Costa Rica is regarded as a politically stable country, with a democratic tradition, comparatively well educated human capital. In terms of its economic structure, in only a few decades Costa Rica transformed its economy from being relatively closed and highly dependent on few agricultural exports, to become the largest exporter of software per capita in Latin America. Additionally, during the past twenty years the volume of Costa Rican exports has grown significantly, and the export of goods and services as a share of Costa Rica Gross Domestic Product (GDP) went from 21 percent in 1960 to almost 50 percent in 2007 (World Bank, 2008). The economic reasoning for this

policy agenda was based on the premise that export growth is conducive to higher per capita income growth. Nevertheless, despite relatively good economic performance in the last 20 years and the implementation of export-promotion policies, Costa Rica has not attained the same high rates of economic growth experienced during the ISI period. Furthermore, the export sector has been heavily dependent on foreign companies, mainly North American multinationals, which have invested in Costa Rica to use its free trade zones as platforms to export their output to other markets. A number of studies have examined the impact that the export-oriented strategy has had on Costa Rican output with mixed results, and some scholars have questioned the real benefits of the recent surge in non-traditional and high added-valued exports on the overall economy.

This study examines the causal relationship between exports and output in Costa Rica using recent advancements in time series techniques, and it contributes to the existing literature on the export-output nexus in multiple ways. Firstly, the ELG hypothesis is tested using longer data series (from 1960 to 2007 and from 1965 to 2006) in conjunction with time series modeling techniques such as, a unit root test that accounts for structural breaks, and a modified version of the Granger-causality test (MWALD hereafter) developed by Toda and Yamamoto (1995) and Dolado and Lütkepohl (1996). The MWALD procedure has a number of advantages over the commonly used multivariate error correction modes (ECM), whose results are well known to be sensitive to the number of variables, lag length selection and the choice of the normalizing cointegration. Another advantage of the MWALD procedure is that its results are valid independently of the integration and cointegration features of the series, which mitigates potential pretest biases (Caporale and Pittis, 1999). According to some scholars, findings from previous studies that tested the ELG hypothesis using Granger-causality tests may have been misleading and biased because relevant variables were not included. The second contribution of this study is that it addresses this issue by expanding the

classical bivariate framework, and included real imports as an endogenous variable in one model, and then capital and labor in another model. Another contribution of the study is the estimation of all models using U.S. real GDP and a temporal dummy variable as exogenous variables. This step is warranted because Costa Rica's economy went through important structural reforms in the 1980s, and has been historically dependent on the United States. The inclusion of U.S. GDP in the model is particularly important given that the United States has been Costa Rica's main trade partner and foreign investor. The final contribution of this paper is the distinction that it makes between GDP and non-export GDP. This is an important issue because exports themselves are a component of GDP, and to avoid specification biases and simultaneity that would arise from this accounting problem, all models are estimated using Costa Rica real GDP adjusted for exports.

The remainder of this paper is organized as follows. In Section 2, empirical literature on the ELG hypothesis is reviewed and a theoretical framework is outlined. Section 3 presents a brief review of some of important events and policies that have affected Costa Rica's trade and economic performance in the last four decades. Section 4 describes the econometric methodology and data set used, while in section 5 empirical results are presented and interpreted. Conclusions and policy implications are offered in section 6.

4.2. Empirical Literature Review and Theoretical Framework

4.2.1 Empirical Literature

A large portion of the empirical research studying the effects of trade liberalization and export promotion policies has focused on the ELG hypothesis, which reflects the view that expansion of exports help to stimulate overall economic growth. Economic theory provides a series of arguments that buttress this hypothesis. Firstly, export growth can lead to productivity gains because of greater economies of scale achieved with the enlargement of the market size. This issue is particularly important for small countries like Costa Rica, which

generally have small domestic markets. Higher exports also provide foreign exchange that allows for increasing levels of imports of capital and intermediate goods. These imports are essential for industrialization and capital formation, which in turn stimulate output growth (McKinnon, 1964; Balassa, 1978; Esfahani, 1991; Buffie, 1992). Another advantage of export-led growth is learning-by-exporting externalities because diffusion of technical knowledge may occur in the form of improved management practices and more efficient production techniques. Eventually these externalities are likely to be transmitted to the non-export sector (Grossman and Helpman, 1991). Export expansion can also have positive impacts on growth through increases in employment and income in the export sector. Higher exposure to other markets is likely to incentive domestic firms to increase investment, become more efficient, and improve their production technology. All this will lead to a productivity differential in favor of the export sector, and when this sector expands at the expense of other sectors, a positive impact to the aggregate output would be expected. Finally, export growth can lead to production specialization based on comparative advantage, which results in a more efficient allocation of a nation's resources.

The study of the role of exports on economic growth is a recurrent issue in the international trade and economic development literature, and the number of empirical studies testing the ELG hypothesis is large¹. Early studies began analyzing the linkages between export and economic growth using a simple bivariate correlation modeling framework (Emery, 1967; Kravis, 1970). More econometrically involved research continued investigating the ELG hypothesis, and these studies can be categorized in two main groups. Due to lack of long time-series data, the first group utilized cross-countries studies that examined the export-growth nexus using cross-sectional or panel data. Pioneering work in

¹ Giles and Williams (2000a) and Bahmani-Oskooee and Economidou (2009) provide comprehensive surveys of the empirical research on the ELG hypothesis by reviewing papers published between 1963 and 1999.

this group includes the studies of Michalopoulos and Jay (1973), Voivodas (1973), Michaely (1977), Balassa (1978a), Heller and Porter (1978), Tyler (1981), Feder (1983) and Kavoussi (1984). Overall, these cross-sectional studies found a significant and positive relationship between export growth and output growth. However, their findings have been criticized because they implicitly assume that countries share common characteristics and have similar production technologies, when in reality they may have different economic, political and institutional structures².

With the development of time series methodologies, a large number of new studies have tested the ELG hypothesis for different countries, often using the Granger-causality test. While results from cross-countries studies generally supported the economic role of exports, time series studies have been less conclusive and failed to provide strong support for the ELG hypothesis (Jung and Marshall, 1985; Chow, 1987; Hsiao, 1987; and Ahmad and Kwan, 1991). More recent empirical research has employed cointegration and error-correction modeling, and found evidence of a bi-directional causality between exports and growth (Kugler and Dridi, 1993; Ahmad and Harnhirun, 1995).

Evidence of the ELG hypothesis in Costa Rica is also mixed and inconclusive, which warrants further research. While a number of time series studies found some evidence in favor of the ELG hypothesis for this country, others failed to do so. Using OLS, Bivariate Granger and VARL, Dodaro (1993) examined the ELG hypothesis for 87 countries for the period of 1967 to 1986. This study confirmed that exports Granger-caused economic growth in Costa Rica. Van den Berg and Schmidt (1994) studied seven Latin American countries using annual data from 1960 to 1987, and found a significant relationship between output and exports in Costa Rica. Sharma and Dhakal (1994) tested causality between exports and

² For a critical review of cross-country studies see Giles and Williams (2000).

growth in 30 developing countries over the period of 1960 to 1988 using two different models. The first model reflected a neoclassical production function with domestic output, exports, labor and capital as endogenous variables, while the second estimated model tested for causality between exports, domestic output, exchange rate, and foreign output. The results for Costa Rica showed causality running from exports to output and from exchange rate and World output to exports. The ELG hypothesis was also tested within a production function framework by Amirkhalkhali and Dar (1995), who examined the role of export expansion in the economies of 23 developing countries between 1961 and 1990. A positive and significant impact of exports on economic growth was found in nine out of 11 Latin American countries, including Costa Rica. In another study, Riezman et al. (1996) investigated the ELG hypothesis for 126 countries using annual data for the period of 1950 to 1990. This study lends support to the ELG hypothesis for only four countries within the Latin American region, including Costa Rica. Medina-Smith (2001) specifically tested the ELG hypothesis for Costa Rica employing cointegration procedures and using annual data for the period of 1950 to 1997. A long-term relationship between GDP and exports was found in this study.

Other time series studies questioned the existence of a export-growth nexus in Costa Rica. Arnade and Vasavada (1995) examined the relationship between real agricultural output and real agricultural exports for 17 Latin American countries and 17 Asian & Pacific Rim countries for the period of 1961 to 87. The ELG hypothesis was not confirmed within the Costa Rican agricultural sector. In another study, Pomponio (1996) examine both the bivariate causal relationships between manufactured export growth and manufactured output growth, and the trivariate causal relationships between manufactured exports, investment and manufactured output. For the bivariate case, no causality was found between exports and output in Costa Rica, and only when the investment variable was included, output and

investment were found to cause exports. More recently Piñeres and Cantavella-Jordá (2007) tested whether exports Granger causes GDP in several Latin American countries using different methodologies and data sources, and for the Costa Rican case the results were mixed.

4.2.2 Theoretical Framework

Based on evidence from previous research, this study proposes three different theoretical frameworks to test the ELG hypothesis in Costa Rica

$$Y = f[(X); USY, T] \quad (1)$$

$$Y = f[(X, M); USY, T] \quad (2)$$

$$Y = f[(K, L, X); USY, T] \quad (3)$$

where Y represents Costa Rica export-adjusted real GDP, and X, M, K, L, USY, and T represent real exports, real imports, gross fixed capital formation as a proxy to capital, labor force, the United States real GDP as a proxy to the foreign economic shocks, and a step time dummy variable that accounts for the economic crisis and the subsequent structural economic reforms, respectively. Each of these three models will attempt to deal with some of the problems commonly found in previous studies that questioned the validity of their results. Y, M, X, K, and L will be estimated as endogenous variables, while the last two variables are included in all three models as exogenous variables³. The first issue to be addressed is the one raised by Greenaway and Sapsford (1994), who cautioned about the need to distinguish between GDP and non-exports GDP given that, exports themselves are a component of GDP. The results from past studies that failed to handle this accounting problem inevitably suffered

³ These variables are assumed to affect the variables system but are not influenced by the endogenous variables. For a small open economy like Costa Rica that is highly dependent on the economy of the U.S., USY will account for output shocks in that country. On the other hand, the step time dummy variables attempts to account for the crisis and structural reforms that affected the proposed endogenous variables.

from specification biases and simultaneity, and to avoid this problem all three models are estimated using Costa Rica adjusted of exports real GDP⁴.

Model 1 represents a classic bivariate framework which has been commonly used in early studies to test for Granger-causality between real GDP and real exports. However, it has been widely accepted that causality tests are sensitive to model selection and functional forms, and that bivariate tests fail to consider other relevant determinants of economic growth (Xu, 1996). Another issued by scholars is associated with testing the ELG hypothesis using the Granger-causality without including imports. This may give misleading results because imported capital goods are inputs for both export and domestic production. Additionally, export growth will earn additional foreign exchange that may relieve constraints to the import of capital goods that in turn would boost economic growth. Riezman et al. (1996) tested the ELG hypothesis in 126 different countries, and when a bivariate framework was used they confirmed it in only 16 countries. However, when imports were included in the estimations the number of cases increased to 30. The inclusion of real imports in model 2 seeks to mitigate this potential variable omission bias.

An augmented Cobb-Douglas production function is estimated in model 3, in where real exports are included as an additional input. This approach aims to handle variable omission bias by including capital and labor in the estimation of the VAR model, and in subsequent Granger-causality test. Finally, the inclusion in all three models of the U.S. real GDP and a step dummy time variable as exogenous variables seeks to correct for misspecification bias that would cast doubts in the final results of this study. This is particularly relevant to account for external economic shocks or internal economic reforms that are likely to have important repercussions in a small open economy like the case of Costa Rica.

⁴ To compute the real GDP adjusted of exports, real exports were subtracted to total real GDP. Both variables are in 2000 US \$.

4.3 Exports and Economic Growth in Costa Rica

Historically, the export sector has played a major economic role in Costa Rica, and as a result of a series of long-term policies promoting export expansion and export diversification the importance of the export sector has increased. In the early 1950s, Costa Rica's economy was heavily dependent on few agroexports (primarily coffee and bananas), and its manufacturing sector accounted for less than ten per cent of its GDP (Zimbalist, 1988). This commodity export economic model meant little industrialization and was vulnerable to external shocks and commodity prices oscillations. In order to overcome these problems, Costa Rica implemented throughout the 1960s and 1970s an ISI development model along with many other Latin American countries. The main objectives of this strategy were to reduce the nation's historical dependence on few agricultural exports, to protect the domestic economy, and to create a competitive national industrial sector. For this purpose, high tariff rates for consumer goods were imposed, low import taxes for intermediates and capital goods were maintained, and export taxes were applied on those goods in which Costa Rica had a strong comparative advantage (Cattaneo *et al*, 1999). Despite its economic protectionist policy, Costa Rican authorities were aware that the country's small domestic market lacked the capability of sustaining GDP growth on the demand size. Furthermore, it would reduce the chances of producing certain goods that are subject to economies of scale, and it would represent an important obstacle to Costa Rica's infant industrial sector. One initial response to this problem was the entry of Costa Rica to the Central American Common Market (CACM) in 1963⁵. The CACM allowed for free trade among the five signatory countries and implemented a common external tariff. For the Costa Rican export sector this meant an expansion of its market from nearly two million to approximately 15 million

⁵ The CACM is an economic trade organization established on December 13 of 1960 and it included Guatemala, El Salvador, Honduras, Nicaragua and later Costa Rica.

potential consumers (Zimbalist, 1988), and the CACM became the main destination market for its manufactured consumer goods.

In sum, the ISI period was relatively successful and was characterized by two decades of sustained high rates of economic growth and overall economic development. However, in the late 1970s Costa Rica experienced one of its worst economic crisis, which was triggered by unsustainable foreign borrowing, rising oil prices and real interest rates, and unfavorable international prices (Weeks, 1985; Buttari, 1992; Gutiérrez de Piñeres et al., 2000). National production was greatly reduced in the agricultural, industrial and construction sectors, and between 1980 and 1982, Costa Rica's GDP contracted by almost ten percent. The severity of this crisis questioned the sustainability of the ISI model and exposed some of its weaknesses: the dependence of the domestic industrial sector on imported inputs; the relatively small size of the domestic and Central American markets, and the unsustainable levels of public debt. Recognizing these important challenges, Costa Rican authorities adopted in the mid 1980s an export-led growth strategy based on export promotion, export diversification, and the attraction of FDI from high-tech sectors aided by international financial and development agencies. In 1982 President Mongue began the implementation of a stabilization plan that included significant structural reforms such as, the reduction of import tariffs, the expansion of export subsidies, the creation of new government and private agencies that aimed at promoting exports and attracting FDI, and the expansion of Free Trade Zones (FTZs). The two latter measures resulted in a significant increase of FDI from high-tech sectors, namely computer parts, electronics, and medical equipment. These industries have become Costa Rica most important non-traditional exports. Another visible outcome from this outward new strategy has been the very rapid expansion of real exports from the late 1980s until present, as it is shown in figure 7. The small reduction registered around the

year 2000 was caused by the economic recession affecting the United States and other countries around the World.

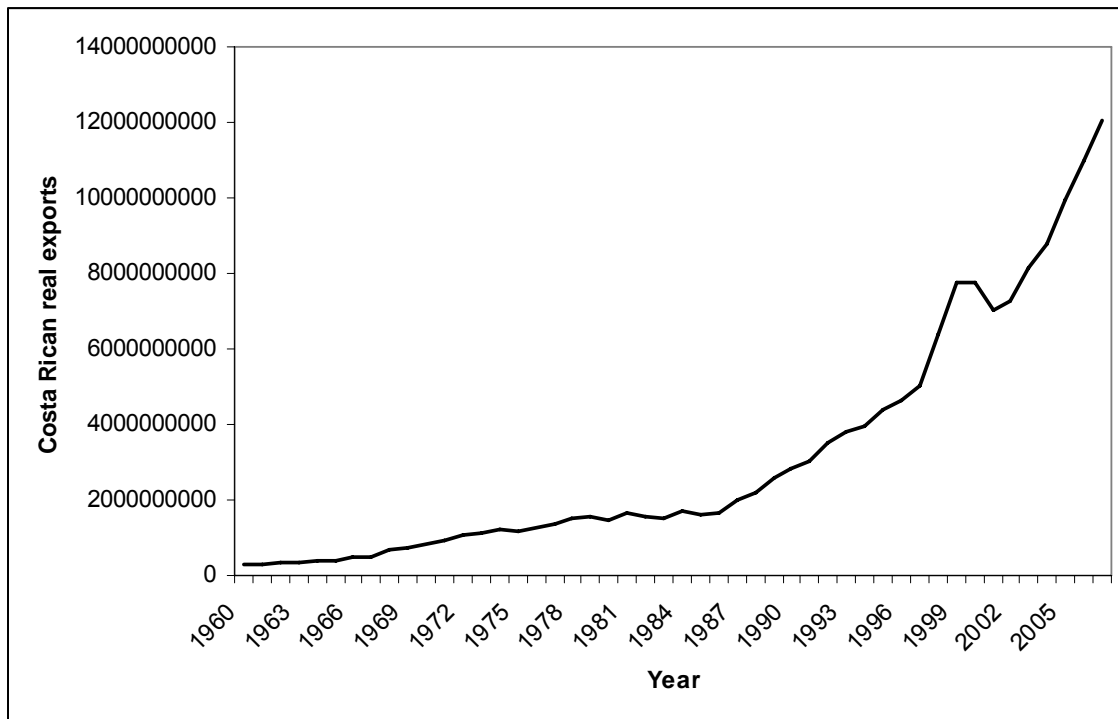


Figure 7: Costa Rica real exports at 200 US\$ constant prices (1960-2007).
Source: World Development Indicators, World Bank (2008).

Despite the visible increase in volume of Costa Rican exports, in particular of industrial goods, a great share of these exports has been produced by foreign firms operating from the FTZs. According to Arce et al. (2008), in 2007 exports from FTZs accounted for almost 55 percent of Costa Rica total exports and included mainly industrial products produced by multinational corporations (i.e. computer parts, electronics, medical equipment, textiles, and processed food products). This dependence of the export sector on foreign firms is the result of an industrialization strategy that emphasizes the attraction of high-tech FDI under the assumptions that capital investment from these industries has a greater potential for spillover effects in comparison to other not so technologically intensive sectors. Another expected externality is the formation of backward linkages between the established foreign and domestic firms. Nevertheless, several scholars have questioned the real benefits of this

model to the overall economy. Ciarli and Giuliani (2005) reported that on average between 2001 and 2003 merely five percent of the inputs processed in Costa Rica by high-tech firms were provided by local suppliers. Moreover, the authors estimated that only about half of these were actually manufactured in Costa Rica. In a case that has remarkable similarities with the Costa Rican one, Lall (1995) argued that Malaysia excessive reliance on foreign-dominated electronics created a shallow industrial sector with very limited linkages with the rest of the economy and a weak national technological base.

Costa Rica represents an interesting example of a small open economy who has managed to expand and diversify its export supply, but whose export-oriented development strategy seems to have failed to generate substantial real benefits to the overall economy. This has been the case arguably because of an excessive dependence of the export sector on foreign firms. Testing for the ELG hypothesis in Costa Rica will provide evidence that may help to explain why Costa Rica economy has not experienced the rates of economic growth registered during the ISI period, despite having a dynamic and well diversified export sector.

4.4 Data and Econometric Methodology

The cointegration technique proposed by Johansen (1988) and Johansen and Juselius (1990) is often used to examine the relationship between exports and economic growth. These procedures are based on the error-correction representation of the VAR(k) model with Gaussian error, but when there are more than two cointegration vectors this may be problematic. Other limitations of these methodologies are related to the fact that the power of cointegration likelihood ratio (LR) tests of Johansen and Juselius is high only when the correlation between the shocks that generate the stationary and non-stationary components is high, and their power tends to rapidly deteriorate when there is over-specification of the lag length (Toda, 1994, Bewley and Yank, 1996). One additional problem is the reliance of this method on conventional unit root and cointegration tests, which in turn were found to suffer

from size distortions and to have low power (Giles and Mirza, 1998). In other words, there are potential distortions associated with tests for unit roots and cointegration, and the stability, and rank conditions are not fulfilled when there is more than one cointegrating vector in a multivariate model. Finally, it has been argued by Toda and Phillips (1993) and Zapata and Rambaldi (1997) that when variables are integrated or cointegrated, the standard Granger-causality tests no longer have asymptotic properties, and the F-test based on VAR or ECM estimations are no longer valid.

This study applies the modified version of the Granger causality test (MWALD) proposed by Toda and Yamamoto (1995) and Dolado and Lütkepohl (1996) to test restrictions on the parameters of the VAR(k) model. This choice is based on the ability of the MWALD to overcome shortcomings associated to alternative econometric methods used in previous studies. More specifically, the MWALD is a more flexible tool that does not require prior knowledge of cointegration properties of the system, and can be carried out even when there is no cointegration and/or the rank conditions are not satisfied (Zapata and Rambaldi, 1997). Another advantage of the MWALD is that it reduces the impact of pre-testing on the conclusions regarding causality, although knowledge of the maximum order of integration and of the lag structure is still required.

The implementation of this method requires two steps. The first step includes determination of lag length (k) and the maximum order of integration (d_{\max}) of the variables in the system. Unit root tests are conducted to determine the maximum order of integration d of the variables in the system, and the appropriate lag structure of the VAR is selected by minimizing the values of the Akaike's information criterion (AIC), the Schwarz's Bayesian criterion (SBIC), and the Hannan and Quinn information criterion (HQIC). Then, the selected lag length (k) of the VAR is artificially augmented by the maximum order of integration in

the system (d_{\max}). Finally, the VAR(p) represented in equation 4 is estimated with all variables with a total of $p = [k + d(\max)]$ lags

$$Z_t = Z_0 + Z_1 y_{t-1} + \dots + Z_p y_{t-p} + \varepsilon_t \quad t = 1, \dots, T \quad (4)$$

where Z_t is a vector of different endogenous variables and ε_t is zero-mean, serially uncorrelated random term. For the three different proposed models, the vector Z_t includes the following variables:

$$\text{Model 1: } Z_{1t} = (Y, X) \quad (5)$$

$$\text{Model 2: } Z_{2t} = (Y, X, M) \quad (6)$$

$$\text{Model 3: } Z_{3t} = (Y, K, L, X) \quad (7)$$

The second step includes conducting inference on Granger causality by carrying out the standard Wald tests to the first k VAR coefficient matrix, which are included in equations 8 through 16.

MODEL 1

$$Y_t = \alpha_0 + \sum_{i=1}^{k+d \max} \beta_{11i} Y_{t-i} + \sum_{i=1}^{k+d \max} \lambda_{11i} X_{t-i} + e_{1t} \quad (8)$$

$$X_t = \tau_0 + \sum_{i=1}^{k+d \max} \beta_{21i} Y_{t-i} + \sum_{i=1}^{k+d \max} \lambda_{21i} X_{t-i} + e_{2t} \quad (9)$$

MODEL 2

$$Y_t = \zeta_0 + \sum_{i=1}^{k+d \max} \beta_{31i} Y_{t-i} + \sum_{i=1}^{k+d \max} \lambda_{31i} X_{t-i} + \sum_{i=1}^{k+d \max} \phi_{11i} M_{t-i} + e_{3t} \quad (10)$$

$$X_t = \omega_0 + \sum_{i=1}^{k+d \max} \beta_{41i} Y_{t-i} + \sum_{i=1}^{k+d \max} \lambda_{41i} X_{t-i} + \sum_{i=1}^{k+d \max} \phi_{21i} M_{t-i} + e_{4t} \quad (11)$$

$$M_t = \sigma_0 + \sum_{i=1}^{k+d \max} \beta_{51i} Y_{t-i} + \sum_{i=1}^{k+d \max} \lambda_{51i} X_{t-i} + \sum_{i=1}^{k+d \max} \phi_{31i} M_{t-i} + e_{5t} \quad (12)$$

MODEL 3

$$Y_t = \xi_0 + \sum_{i=1}^{k+d \max} \beta_{61i} Y_{t-i} + \sum_{i=1}^{k+d \max} \lambda_{61i} X_{t-i} + \sum_{i=1}^{k+d \max} \psi_{11i} K_{t-i} + \sum_{i=1}^{k+d \max} \pi_{11i} L_{t-i} + e_{6t} \quad (13)$$

$$X_t = \chi_0 + \sum_{i=1}^{k+d \max} \beta_{71i} Y_{t-i} + \sum_{i=1}^{k+d \max} \lambda_{71i} X_{t-i} + \sum_{i=1}^{k+d \max} \psi_{21i} K_{t-i} + \sum_{i=1}^{k+d \max} \pi_{21i} L_{t-i} + e_{7t} \quad (14)$$

$$K_t = \delta_0 + \sum_{i=1}^{k+d \max} \beta_{81i} Y_{t-i} + \sum_{i=1}^{k+d \max} \lambda_{81i} X_{t-i} + \sum_{i=1}^{k+d \max} \psi_{31i} K_{t-i} + \sum_{i=1}^{k+d \max} \pi_{31i} L_{t-i} + e_{8t} \quad (15)$$

$$L_t = \gamma_0 + \sum_{i=1}^{k+d \max} \beta_{91i} Y_{t-i} + \sum_{i=1}^{k+d \max} \lambda_{91i} X_{t-i} + \sum_{i=1}^{k+d \max} \psi_{41i} K_{t-i} + \sum_{i=1}^{k+d \max} \pi_{41i} L_{t-i} + e_{9t} \quad (16)$$

The MWALD has an asymptotic chi-squared distribution with k degrees of freedom in the limit when the VAR $[k + d(\max)]$ is estimated, and the order of integration of the process cannot be greater than the true lag length of the model, that is $d(\max) \leq k$. Since all the variables are in levels, the results provide information about the long-run causal relationships among the variables in the VAR system.

The data set used in this paper consist of annual observations obtained from the 2008 *World Development Indicators* on Costa Rica real GDP, real exports, real imports, gross fixed formation capital as a proxy to capital, labor force, and the United States real GDP as a proxy to the foreign economic shocks. All variables are expressed in 2000 constant U.S. dollars, with the exemption of labor force and time dummy variable which were measured in units, and were transformed into the logarithm form. Given data availability, for model one and two the sample period is of 1960 to 2007, whereas for the augmented neo-classical production function the data covers the period going from 1965 to 2006. Complete variable definitions and data sources are provided in appendix 2.

4.5 Empirical Results

4.5.1 Unit Root Tests

Prior to testing for causality, it is necessary to establish the order of integration of each variable. A visual inspection to the plots of each variable, and to both autocorrelation functions (ACF) and partial autocorrelation functions (PCF) suggest that all variables are

linearly trended. Even though this implies that the series are potentially nonstationary, formal unit root tests are needed for more concrete conclusions. The stationarity of the series is first investigated by applying the following unit root tests: the augmented Dickey-Fuller (ADF), the Phillips-Perron (1988) test (PP), the Kwiatkowski et al. (1992) test (KPSS), and a modified Dickey-Fuller test (DFGLS) proposed by Elliot et al. (1996). These tests are applied to the variables in log levels and in first differences of the logs, and the results are shown in table 9 for model one and two, and in table 10 for model three⁶. Overall, the tests suggest that, at conventional levels of significance, none of the variables represents a stationary process, thus all variables are integrated of order one, $I(1)$. However, when testing for stationary of a series that exhibits a structural break these conventional unit root tests tend to identify a structural break in the series as evidence of nonstationarity, and thereby fail to reject the null hypothesis of nonstationarity (Lumsdaine and Papell, 1997). A look at the plots of series reveals that most of them exhibit a change in their mean within the first years of the 1980s, which coincides with the severe economic crisis that affected the country and the important structural economic reforms that were implemented in the early 1980s.

Table 9. Augmented Dickey-Fuller, Phillips-Perron, Kwiatkowski et al. and DFGLS tests for unit roots for Model 1 and Model 2

	ADF		PP		KPSS		DFGLS	
Levels	Z(t)	5%	Z(t)	5%	Z(t)	5%	Z(t)	5%
LAGDP	-1.69	-3.51	-1.76	-3.51	0.20	0.15	-1.49	-3.25
LX	-1.66	-3.51	-1.92	-3.51	0.09	0.15	-1.94	-3.25
LM	-1.92	-3.51	-2.284	-3.51	0.08	0.15	-2.69	-3.25
First differences								
Δ LAGDP	-4.91	-3.52	-4.86	-3.52	0.07	0.15	-4.24	-3.26
Δ LX	-5.85	-3.52	-5.85	-3.52	0.08	0.15	-4.62	-3.26
Δ LM	-4.82	-3.52	-4.76	-3.52	0.05	0.15	-4.44	-3.26

⁶ Because all variables exhibit linear upward trends, the unit root tests were computed with an intercept together with a trend. However, the same tests were also computed without a trend and no major qualitative differences were found between the two versions.

Table 10. Augmented Dickey-Fuller, Phillips-Perron, Kwiatkowski et al. and DFGLS tests for unit roots for Model 3

	ADF		PP		KPSS		DFGLS	
Levels	Z(t)	5%	Z(t)	5%	Z(t)	5%	Z(t)	5%
LAGDP	-2.32	-3.54	-2.36	-3.54	0.16	0.15	-1.94	-3.30
LL	-2.22	-3.54	-2.06	-3.54	0.16	0.15	-1.51	-3.30
LK	-2.02	-3.54	-2.35	-3.54	0.80	0.15	-2.50	-3.30
LX	-1.97	-3.54	-2.20	-3.54	0.11	0.15	-2.51	-3.30
First differences								
Δ LAGDP	-4.00	-3.54	-3.87	-3.54	0.07	0.15	-4.06	-3.31
Δ LL	-7.74	-3.54	-7.98	-3.54	0.07	0.15	-5.76	-3.31
Δ LK	-5.23	-3.54	-5.22	-3.54	0.06	0.15	-3.96	-3.31
Δ LX	-5.15	-3.54	-5.12	-3.54	0.12	0.15	-3.95	-3.31

To formally evaluate the time series properties in the presence of a structural break at an unknown point in time, the Zivot and Andrews (1992) (ZA) unit root test is undertaken.

Table 11. Zivot and Andrews unit root test with structural break for Model 1 and Model 2

	ZA		
Levels	Z(t)	5%	Year
LAGDP	-3.58	-4.80	1970
LX	-3.30	-4.80	1980
LM	-5.90	-4.80	1981
First differences			
Δ LNGDP	-5.89	-4.80	1979
Δ LX	-6.93	-4.80	1986
Δ LM	-5.69	-4.80	1982

Table 12. Zivot and Andrews unit root test with structural break for Model 3

	ZA		
Levels	Z(t)	5%	Year
LAGDP	-3.81	-4.80	1973
LL	-4.24	-4.80	1991
LK	-5.55	-4.80	1982
LX	-3.73	-4.80	1982
First differences			
Δ LNGDP	-5.64	-4.80	1979
Δ LL	-7.08	-4.80	1996
Δ LK	-5.91	-4.80	1979
Δ LX	-6.42	-4.80	1986

Tables 11 and 12 present the results for model 1 and 2, and model 3 respectively. In all cases, evidence confirmed that all series are $I(1)$ even when a structural break is accounted for with the exception of the log of real imports, which is stationary in levels.

4.5.2 Granger Causality Tests

Different diagnostic tests were conducted to confirm the validity of the results after the estimation of each VAR model and prior to the employment of the MWALD procedure. In past studies using VAR models it has been assumed that the disturbances are not autocorrelated, however the present study applies the Lagrange-multiplier (LM) test and no autocorrelation was found. Furthermore, the Jarque-Bera statistic, a kurtosis statistic, and a skewness statistic were computed to test the null hypothesis that the disturbances in the VAR systems are normally distributed. The results here are mixed, which is likely to be due to the relatively small size of the samples used. Finally, the stability condition of the VAR estimates was checked and confirmed in all estimated models.

For the purpose of comparison, the MWALD test was carried out for the three models with and without the inclusion of the two proposed exogenous variables.

Table 13: Granger causality test results based on the Toda-Yamamoto procedure (without U.S. GDP and time dummy exogenous variables).

Null Hypothesis	F-Statistic	p-Value from Causality Test	
Model 1			
Exports → AGDP	1.80	0.1786	
AGDP → Exports	0.77	0.4692	
Model 2			
Exports → AGDP	4.27	0.0219	**
AGDP → Exports	0.45	0.6415	
Imports → AGDP	0.68	0.5134	
AGDP → Imports	0.02	0.9773	
Imports → Exports	7.65	0.0018	**
Exports → Imports	2.04	0.1451	
Model 3			
Exports → AGDP	0.31	0.5811	
AGDP → Exports	0.24	0.6259	

* and ** denote 10 and 5 per cent level of significance respectively.

Table 14: Granger causality test results based on the Toda-Yamamoto procedure (with U.S. GDP and time dummy exogenous variables).

Null Hypothesis	F-Statistic	p-Value from Causality Test	
Model 1			
Exports → AGDP	1.08	0.3507	
AGDP → Exports	0.02	0.9845	
Model 2			
Exports → AGDP	2.65	0.0856	*
AGDP → Exports	0.32	0.727	
Imports → AGDP	0.51	0.6057	
AGDP → Imports	0.02	0.9785	
Imports → Exports	4.08	0.0261	**
Exports → Imports	0.19	0.6666	
Model 3			
Exports → AGDP	0.70	0.5615	
AGDP → Exports	1.31	0.3008	

* and ** denote 10 and 5 per cent level of significance respectively.

Table 13 shows the results from the MWALD test without the inclusion of the exogenous variables, while table 14 corresponds to the causality test results with the exogenous variables. In both cases, no evidence was found to support the ELG hypothesis in the bivariate and in the augmented production function models. Only in the model where imports were included, causality between exports and output became statistically significant at five percent without the inclusion of the exogenous variables, and at ten percent significance level when the U.S. GDP and the time dummy variables were also included. These results suggest that the existence of a long-run causal relationship between exports and GDP growth is affected indirectly by real imports. At the same time a significant causality flowing from imports to exports was also found, indicating that the export sector may have subsidized imports in the form of inputs. Arguably, this reflects the importance of efficiency-seeking FDI in Costa Rica, which in turn has led to increased dependence on imports of capital goods and manufacturing inputs to support the growth of manufactures exports -

whose share to total exports has increased from 28 percent in 1980 to almost 65 percent in 2006.

These findings are in line with the arguments presented by previous studies, which argued that the large number of multinational corporations operating from Costa Rica's FTZ has undoubtedly contributed to an increase in exports and direct employment, but failed to generate substantial linkages with the rest of the economy and intra-industry trade (Sanchez-Ancochea, 2006; Giuliani, 2008). Additionally, these firms import a large share of their inputs from their own subsidiaries or from companies operating in other countries and the most notable example of this is Intel. Despite the significant size of its investments in Costa Rica, this firm has been operating more as an enclave. More specifically, Intel has been importing most of its components for its assembly operation and had failed to generate a significant economic multiplier (World Bank, 2006).

4.6 Conclusions and Policy Implications

The present study has employed the Granger-causality procedure developed by Toda and Yamamoto (1995) to examine the export-led growth hypothesis for Costa Rica. Using annual data from 1960 to 2007 and from 1965 to 2006, depending on the model being estimated, the analysis began with a simple bivariate framework. The empirical results indicate that changes in real exports do not precede changes in real GDP with and without the inclusion of the U.S. real GDP and a time dummy as exogenous variables. However, because bivariate systems have been criticized as incomplete for omitting potentially important variables, the MWALD test was carried out again with the inclusion of real imports as an endogenous variable. The results suggest that there is a significant causal relationships running from exports to GDP, and from imports to exports. Despite some loss of statistical significance, the causal links held even when exogenous variables were included in the VAR estimation. Finally, a third model was estimated in the form of an augmented production

function including capital, labor and exports as inputs. Once again, the MWALD test failed to find a causal relationship between exports and Costa Rica's GDP.

Granger-causality flowing from exports to GDP and from imports to exports seems to confirm a dependence of Costa Rica's export sector on imports in the form of inputs. According to endogenous growth models, imports may become indirect channels for long-run economic growth when they provide domestic firms needed intermediate technology and foreign-technology. In the case of Costa Rica, when multinational firms import technologically advanced inputs to produce and export high value-added goods, this seems to have a positive impact on exports, which in turn becomes conducive to higher economic growth. Thus, in this case econometric evidence is found supporting the ELG hypothesis in Costa Rica.

In terms of future policy choices by Costa Rican governments these findings has important implications. In the absence of complementary development policies, exports alone will fail to stimulate high economic growth and raise the standard of living of most Costa Ricans. Hence, a new strategy should seek to increase the share of export products produced by domestic firms to create a stronger national export sector capable of generating significant spillovers to the rest of the economy, and thus to contribute to economic growth. Finally, Costa Rican governments should not discontinue their policies that have successfully attracted numerous foreign investors in high-tech sectors in the hope that this would lead to technology transfer and to the generation of technological spillovers in Costa Rica economy. Instead, new policies should promote and facilitate the creation of further linkages between foreign export firms operating at the FTZ and domestic firms so that the latter may become competitive input suppliers of the former. This may represent the path through which the export sector can transform Costa Rica' economy and contribute to its future development.

4.7 References

- Ahmad, j. and Harnhirun, S. (1995). Unit roots and cointegration in estimating causality between exports and economic growth: Empirical evidence from the ASEAN countries. *Economic Letters*, 49, 329-34.
- Ahmad, J. and Kwan, A. C. C. (1991). Causality between exports and economic growth: Empirical evidence from Africa. *Economic Letters*, 37, 243-248.
- Amirkhalkhali, S. and Dar, A.-A., (1995). A varying-coefficients model of export expansion, factor accumulation and economic growth: Evidence from cross-country, time series data. *Economic Modelling*, 12, 435-41.
- Andrews, D. and Zivor, E. (1992). Further evidence on the Great Crash, the oil price shock and the unit-root hypothesis. *Journal of Business and Economic Statistics* 10, 251-70.
- Arce, R., Chacón, E., Chaves, G., and Tristán A. (2008) Análisis de las estadísticas de exportación Costa Rica, 2007. Promotora del Comercio Exterior de Costa Rica (PROCOMER): Dirección de Estudios Economicos. San José, Costa Rica.
- Arnade, C. and Vasavada, U. (1995). Causality between productivity and exports in agriculture: evidence from Asia and Latin America. *Journal of Agricultural Economics*, 46, 174-86.
- Bahmani-Oskooee, M. and Economidou, C. (2009). Export led growth vs. growth led exports: LDCs Experience. *The Journal of Developing Areas*, 42(2), 179-212.
- Balassa, B. (1978a). Exports and growth: Further evidence. *Journal of Development Economics*, 5(2), 181-189.
- Barquero S., M. (2006a.). “Menos de 10% de ingresos por café y melón llegan al productor.” *La Nación*, March 29, sec. “Economía.”
- Bewley, R. and Yang, M. (1996). On the size and power of system tests for cointegration. In M. McAleer *et al* (eds) *Proceedings of Econometric Society of Australasian Meeting*, 3, 1-20, Perth, Australia.
- Buffie, E. F. (1992). On the condition for export-led growth. *Canadian Journal of Economics*, 25, 211-25.
- Buttari, J. J. (1992). Economic policy reform in four Central American countries: patterns and lessons learned. *Journal of Interamerican Studies and World Affairs*, Vol. 34, No. 1.
- Carporal, G. M. Pittis, N. (1999). Efficient estimation of cointegrating vectors and testing for causality in vector autoregressions. *Journal of Economic Surveys*, 3, 3-35.
- Cattaneo, A., Hinojosa-Ojeda, R.A. and Robinson, S. (1999). Costa Rica trade liberalization, fiscal imbalances, and macroeconomic policy: a computable general equilibrium model, *North American Journal of Economics and Finance*, 10, 39-67.
- Chow, P.C. Y. (1987). Causality between export growth and industrial performance: evidence from NICs. *Journal of Development Economics*, 26(1), 55-63.

Ciarli, T. and Giuliani, E. (2005). Inversion extranjera directa y encadenamientos productivos en Costa Rica, in M. Cimoli (ed.) *Heterogeneidad estructural, asimetrías tecnológicas y crecimiento en América Latina*, pp. 127-62. Santiago de Chile: United Nations.

Dodaro, S., "Exports and growth: A reconsideration of causality", *Journal Developing Areas*, 1993, Vol. 27, pp.227-44.

Dolado, J.J. and Lutkepohl, H. (1996). Making Wald tests work for cointegrated VAR systems. *Econometric Review* 15, 369-386.

Elliot, G. Rothenberg T. J., and Stock, J. H. (1996). Efficient tests for an autoregressive unit root. *Econometrica* 64, 813-836.

Emery, R. F. (1967). The relation of exports and economic growth. *Kyklos*, 20, 470-86.

Esfahani, H. S.(1991). Exports, imports, and economic growth in semi-industrialized countries. *Journal of Development Economics* 35, 163-72.

Feder, G. (1983). On exports and economic growth. *Journal of Development Economics*, 12, 59-73.

Giles, J.A. and Mirza, S. (1998). Some pretesting issues on testing for Granger non-causality. Mimeo, Department of Economics, University of Victoria.

Giuliani, E. (2008). Multinational corporations and patterns of local knowledge transfer in Costa Rican high-tech industries. *Development and Change*, 39(3), 385-407.

Greenaway, D. and Sapsford, D. (1994a). What does trade liberalization do for exports and growth. *Weltwirtschaftliches*, 130, 152-74.

Grossman, G. M. and Helpman, E. (1991). *Innovation and Growth in the Global Economy*. Cambridge, MA: MIT Press.

Gutiérrez-de-Piñeres, S. A. and Ferrantino, M. (2000). Export dynamics and economic growth in Latin America: a comparative perspective. Ashgate Publishing, 2000.

Hsiao, M. W. (1987). Tests of causality and exogeneity between exports and economic growth: The case of Asian NICs. *Journal of Economic Development*, 12, 143-159.

Heller, P. S. and Porter, R. C. (1978). Exports and growth: An empirical reinvestigation. *Journal of Development Economics*, 5, 191-3.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, 12, 231-254.

Johansen, S. and Juselius, K. (1990). Maximum likelihood estimation and inferences on cointegration with application to the demand for money. *Oxford Bulletin of Economics and Statistics*, 52, 169-210.

- Jung, W.S. & Marshall, P.J. (1985). Exports, growth and causality in developing countries. *Journal of Development Economics*, 18, 1-12.
- Kavoussi, R. M. (1984). Export expansion and economic growth: Further empirical evidence. *Journal of Development Economics*, 14, 241-50.
- Kravis, I. B. (1970). Trade as a handmaiden of growth: similarities between the nineteenth and twentieth centuries. *Economic Journal*, 80, 850-70.
- Kugler, P. and Dridi, J. (1993). Growth and exports in LDCs: A multivariate time series study. *International Review of Economics and Business*, 40, 759-67.
- Kwiatkowski, C., Phillips P. C. B. , Schmidt, P. and Shin, Y. (1992). Testing the null hypothesis of stationarity against the alternative of a unit root: How sure are we that economic time series have a unit root? *Journal of Econometrics*, 54, 159-178.
- Lall, S. (1995). Malaysia's industrial success and the role of government. *Journal of International Development*, 7(5), 759-73.
- Lumsdaine, R. L. and Papell, D. H. (1997). Multiple trend breaks and the unit-root hypothesis. *Review of Economics and Statistics*, 79(2), 212-218.
- McKinnon, R. (1964). Foreign exchange constraint in economic development and efficient aid allocation. *Economic Journal*, 74, 388-409.
- Medina-Smith, Emilio J. (2001). Is the export-led growth hypothesis valid for developing countries? A case study of Costa Rica. Policy Issues in International Trade and Commodities Study Series No. 7. United Nations, New York and Geneva.
- Michaely, M. (1977). Exports and economic growth: An empirical investigation. *Journal of Development Economics*, 4, 49-53.
- Michalopoulos, C., and Jay, K. (1973). Growth of exports and income in the developing world: a neoclassical view. Discussion Paper No. 28, US Agency of International Development, Washington DC.
- Phillips, P. C., and Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika* 75, 335-346.
- Pomponio, X. Z. (1996). A causality analysis of growth and export performance. *Atlantic Economic Journal*, 24, 168-76.
- Riezman, R. G., Summers, P.M. and Whiteman, C. H, (1996). The engine of growth or its handmaiden? A time series assessment of export-led growth. *Empirical Economics*, 27, 77-113.
- Sanchez-Ancochea, D. (2006). Development trajectories and new comparative advantages: Costa Rica and the Dominican Republic, *World Development*, 34, No.6, 996-1015.
- Sharma, S.C. and Dhakal, D. (1994). Causal analysis between exports and economic growth in developing countries. *Applied Economics*, 26, 1145-57.

Toda, H.Y. and Yamamoto, T. (1995). Statistical Inference in vector autoregressions with possibly integrated processes. *Journal of Econometrics* 66, 225-250.

Toda, H.Y. (1994). Finite sample properties of likelihood ratio tests for cointegration ranks when linear trends are present. *Review of Economics and Statistics*, 76, 66-79.

Toda, H.Y. and Phillips, P.C.B. (1993). Vector autoregression and causality. *Econometrica*, 61(6), 1367-93.

Tyler, T.W. (1981). Growth and export expansion in developing countries: Some empirical evidence. *Journal of Development Economics*, 9(1), 121-130.

Van den Berg H., and Schmidt, J. R. (1994). Foreign trade and economic growth: Time series evidence from Latin America. *The Journal of International Trade & Economic Development*, 3(3), 249-68.

Voivodas, C. S. (1973). Exports, foreign capital inflow, and economic growth. *Journal of International Economics*, 3, 337-49.

Weeks, J. (1985). The economies of Central America. Publisher: Holmes & Meier. Place of Publication: New York.

World Bank (2006). The impact of Intel in Costa Rica: Nine years after the investment. Washington D.C.: World Bank.

Xu, Z. (1996). On the causality between export growth and GDP growth: An empirical reinvestigation. *Review of International Economics*, 4, 172-84.

Zapata, H.O. and Rambaldi, A.N. (1997). Monte Carlo evidence on cointegration causation. *Oxford Bulletin of Economics and Statistics*, 59(2), 285-298.

Zimbalist, A. (1988). Problems and Prospects of Export Diversification: Case Studies (Costa Rica), in Paus, E. (ed.) *Struggle Against Dependence: Nontraditional Export Growth in Central American and the Caribbean*, pp. 21-40, Westview Press Inc.

CHAPTER 5: SUMMARY AND CONCLUSIONS

The general objective of this journal style dissertation was to empirically examine the effect that export diversification and export expansion has had on Costa Rica's Gross Domestic Product (GDP) for the last 40 years. Investigating the Costa Rican case is particularly important because, export of goods and services as a share of its Gross Domestic Product (GDP) has gone from 21 percent in 1960 to almost 50 percent in 2007 (World Bank, 2008). Furthermore, Costa Rica has become the highest exporter of software per capita in the Latin American region. However, several scholars have questioned the real benefits that recent policies promoting export growth and export diversification along with the attraction of important foreign direct investment (FDI) in high-tech sectors have had to the rest of the economy. This dissertation is an attempt to shed light on this issue.

Chapter 2 provides an in-depth historical review of the most important policies and events that have contributed to the diversification of Costa Rica export base in the last 40 years. For that purpose, the period of study was divided in three different sub-periods. The first sub-period began in the 1960s and ended in the late 1970s and was marked by the implementation of the import substitution industrialization (ISI) development model and by the entry of Costa Rica into the Central American Common Market (CACM) in 1963. The second period was characterized by a severe economic crisis in the early 1980s that led to the abandonment of the ISI model, and triggered the implementation of important structural economic reforms. In the last period, which goes from the mid 1980s until present, Costa Rica adopted a new economic model based on the promotion and diversification of exports, and on the attraction of foreign direct investment (FDI). This study also computes three different measures of export diversification which are analyzed within the chronological analysis described above.

For almost two decades, the ISI managed to create a domestic industrial sector and to generate sustained economic growth, however little progress was done in terms of export diversification. Nevertheless, this closed economic model proved inadequate to overcome the challenges posed by the severe economic crisis in the early 1980s, and consensus was reached to foster exports of high-value added manufactured goods and gain competitive advantages in the industrial sector. As a result of trade liberalization policies implemented since the mid-1980s, the three measures of export diversification have experienced great improvements, and today Costa Rica has a well diversified and dynamic export sector that produces many goods with high technology-content. Importantly, despite a reduction of economic volatility during the third period of analysis, overall economic growth in recent years never reached the levels experienced during the ISI period.

Chapter 3 focuses on the associations between export diversification and economic growth in Costa Rica, and follows the work of Herzer and Nowak-Lehmann's (2006) for Chile. The theoretical framework is based on the premise that export diversification may influence economic growth via positive externalities of learning-by-exporting and learning-by-doing. The estimation of an augmented Cobb-Douglas production function is based on time series for the period 1965-2006 and includes regressing output growth on capital input, labor input, and on measures of both horizontal and vertical export diversification. Four different unit root tests were used to examine the time series properties of all the variables, and even when structural breaks were accounted for, the results suggest that all variables are integrated of order one $I(1)$ with the exemption of horizontal and vertical export diversification, which are stationary in levels. Because of the impossibility of using the Johansen cointegration procedure, long-run relationships are first examined using the autoregressive distributive lag (ARDL) method developed by Pesaran and Shin (1995) and Pesaran *et al.* (2001). This procedure yields consistent estimates of the long run coefficients

that are asymptotically normal irrespective of whether the underlying regressors are purely $I(0)$, purely $I(1)$ or fractionally cointegrated. Then, in order to test the robustness of the results from the ARDL method, the empirical model is again estimated using a procedure known as Dynamic OLS (DOLS) developed by Stock and Watson (1993). Results from both procedures showed positive and significant long-run impacts of both capital and labor inputs on output growth, but failed to find a significant long-run relationship between horizontal or vertical export diversification and economic growth. These findings contradict those from other empirical studies that identified positive linkages between export diversification and economic growth in other economies, and may be the reflection of some specificities of the export diversification experience in Costa Rica. First, the successful diversification of Costa Rican economy was only possible because of the creation of export processing zones and the granting of several export incentives by Costa Rican authorities, which were central in the attraction of foreign capital. Secondly, many of the foreign firms operating in Costa Rica are high-tech sectors, export most of their output to other markets, and import most of their inputs from other countries. These conditions may have restricted the amount of knowledge spillovers generated by the export sector, and limited its linkages with the rest of the economy.

Chapter 4 examines the Export-led growth (ELG) hypothesis for Costa Rica using annual data from 1960 to 2007 and from 1965 to 2006, depending on which of the three proposed model is estimated. Four different unit root tests were used to test for stationarity, and all variables, with the exception of real imports, were found to be integrated of order one $I(1)$ when a structural break in the series were considered. In order to deal with some of the shortcomings present in previous empirical research, this study proposes three different models to test the ELG hypothesis in Costa Rica. Model one is a simple bivariate framework that includes real exports and real output. Model two incorporates real imports, and a third

model has the form of an augmented Cobb-Douglas production function, in where real exports are included as an additional input.

A modified version of the Wald-causality (MWALD) test developed by Toda and Yamamoto (1995) and Dolado and Lütkepohl (1996) was employed to test the existence of a causal relationship between exports and output growth. The results failed to lend support to the ELG hypothesis in Costa Rica, with the exception of the model where imports were included. Only in the latter case, Granger-causality was found running from exports to output and from imports to exports. Although these findings are not in line with those from some other empirical studies, they do corroborate the idea that exports in Costa Rica have been dependent on imports in the form of inputs from multinational firms operating in the country. Moreover, this study has computed three different models and incorporated two exogenous variables to handle some specification and econometric problems that other studies failed to. The main conclusion from this estimation is that there is a long-run causal relationship between exports and GDP growth that is affected indirectly by real imports.

Overall, this dissertation supports the idea that the export promoting and FDI attraction policies implemented by the Costa Rican government in the mid 1980s did succeed in the expansion and diversification of the country's export sector. However, no econometric evidence was found of a long-run linear relationship between both horizontal and vertical export diversification and economic growth. Additionally, exports were found to Granger-cause output growth only when imports were considered. These findings suggest that in the absence of complementary development policies, exports alone will fail to stimulate economic growth and raise the standard of living of most Costa Ricans. Therefore, the emphasis put forth by the Costa Rican authorities on export diversification, export promotion and attraction of FDI should be reevaluated. New policies should seek the formation of

stronger linkages between foreign export firms and domestic firms, and should provide additional support to the creation of small and medium domestic export-oriented firms.

5.1 References

- Dolado, J.J. and Lutkepohl, H. (1996). Making Wald tests work for cointegrated VAR systems. *Econometric Review* 15, 369-386.
- Herzer, D. and Nowak-Lehmann D. F. (2006). What does export diversification do for growth? An econometric analysis, *Applied Econometrics*, 38, 1825-1838.
- Pesaran, M.H. and Shin, Y. (1995). An autogressive distributed lag modeling approach to cointegration analysis." In Centennial Volume of Rangar Frishc (Eds.). S. Strom, A. Holly, and P. Diamond, Cambridge University Press, Cambridge.
- Pesaran, M.H., Shin, Y. and Smith, R.J. (2001). Bounds testing approaches to the analysis of level relationships, *Journal of Applied Econometrics*, 16, 289-326.
- Stock, J. H. and Watson, M. (1993). A simple estimator of cointegrating vectors in higher order integrated systems, *Econometrica*, 61, 783-820.
- Toda, H.Y. and Yamamoto, T. (1995). Statistical Inference in vector autoregressions with possibly integrated processes. *Journal of Econometrics* 66, 225-250.

APPENDIX 1: DEFINITIONS OF ACRONYMS

ACF: Autocorrelation Function
ADF: Augmented-Dickey Fuller unit root test
AIC: Akaike's Information Criterion
ARDL: Autogressive Distributed Lag
CACM: Central American Common Market
CAT: *Certificado de Abono Tributario*
CBI: Caribbean Basin Initiative
CODESA: Costa Rican Development Corporation
COMTRADE: The United Nation Trade Dataset
DFGLS: Modified Dickey-Fuller test developed by Elliot et al. (1992)
DOLS: Stock-Watson Dynamic Ordinary Least Squares
ECLA: Economic Commission on Latin America
ELG: Export-led Growth
FDI: Foreign Direct Investment
FTZ: Free Trade Zone
GDP: Gross Domestic Product
GNI: Gross National Income
HQIC: Hanna and Quinn Information Criterion
IMF: International Monetary Fund
ISI: Import Substitution Industrialization
KPSS: Kwiatkowski et al. (1992) unit root test
LM: Lagrange-multiplier
MINEX: Costa Rica Ministry of Foreign Trade
MWALD: Modified Wald Test proposed by Toda and Yamamoto (1995) and Dolado and Lütkepohl (1996).
PACF: Partial Autocorrelation Function
PP: Phillips and Perron (1988) unit root test
PROCOMER: *Promotora del Comercio Exterior de Costa Rica*
PV: Perron and Vogelsang (1992) unit root test
SITC: Standard International Trade Classification
SBIC: Schwarz's Bayesian Information criterion
TAR: Temporal Admission Regime
USAID: United States Agency for International Development
VAR: Vector Autoregressive
ZA: Zivot and Andrews (1992) unit root test
WDI: World Development Indicators

APPENDIX 2: VARIABLES DEFINITIONS AND DATA SOURCES

GDP at constant prices (US\$ 2000) (Y)

GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2000 U.S. dollars. Dollar figures for GDP are converted from domestic currencies using 2000 official exchange rates. For a few countries where the official exchange rate does not reflect the rate effectively applied to actual foreign exchange transactions, an alternative conversion factor is used.

Source: World Development Indicators online version, World Bank 2008.

Adjusted of exports real GDP (US\$ 2000) (AGDP)

The adjusted of exports real GDP is computed by subtracting real exports to total real GDP. Both variables are in 2000 US \$.

Source: World Development Indicators online version, World Bank 2008.

Export of goods and services (US\$ 2000) (X)

Export of goods and services represent the value of all goods and other market services provided to the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. They exclude labor and property income (formerly called factor services) as well as transfer payments. Data are in constant 2000 U.S. dollars.

Source: World Development Indicators online version, World Bank 2008.

Import of goods and services (US\$ 2000) (M)

Imports of goods and services represent the value of all goods and other market services received from the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. They exclude labor and property income (formerly called factor services) as well as transfer payments. Data are in constant 2000 U.S. dollars.

Source: World Development Indicators online version, World Bank 2008.

Gross fixed capital formation (US\$ 2000) (K)

Gross fixed capital formation is measured by the total value of a producer's acquisitions, less disposals, of fixed assets during the accounting period plus certain additions to the value of non-produced assets (such as subsoil assets or major improvements in the quantity, quality or productivity of land) realized by the productive activity of institutional units.

Source: World Development Indicators online version, World Bank 2008.

Step time dummy variable (*du80*)

This variable assumes the value 1 from 1980 onwards and zero otherwise.

Source: Author's own calculations.

Impulse time dummy variable (*d80*)

This variable has a value of 1 in 1980 and zero otherwise.

Source: Author's own calculations.

Labor force, total (L)

Total labor force comprises people who meet the International Labor Organization definition of the economically active population: all people who supply labor for the production of goods and services during a specified period. It includes both the employed and the unemployed. While national practices vary in the treatment of such groups as the armed forces and seasonal or part-time workers, in general the labor force includes the armed forces, the unemployed and first-time job-seekers, but excludes homemakers and other unpaid caregivers and workers in the informal sector.

Source: World Development Indicators online version, World Bank 2008.

Vertical export diversification (MX)

Manufactures exports as a percentage of total merchandise exports. Manufactures comprise commodities in SITC sections 5 (chemicals), 6 (basic manufactures), 7 (machinery and transport equipment), and 8 (miscellaneous manufactured goods), excluding division 68 (non-ferrous metals).

Source: World Development Indicators online version, World Bank 2008.

Horizontal export diversification (S)

The number of export sectors classified by the Standard International Trade Classification (SITC) at the three-digit level.

Source: United Nations dataset (COMTRADE).

Herfindahl Export Concentration Index

A measure of the concentration of the export supply. When the index value approaches one, it means that a country has a greater reliance on a limited group of exports, while a value closer to zero represents a higher degree of export diversification.

Source: United Nations dataset (COMTRADE).

APPENDIX 3: VARIABLES PLOTS

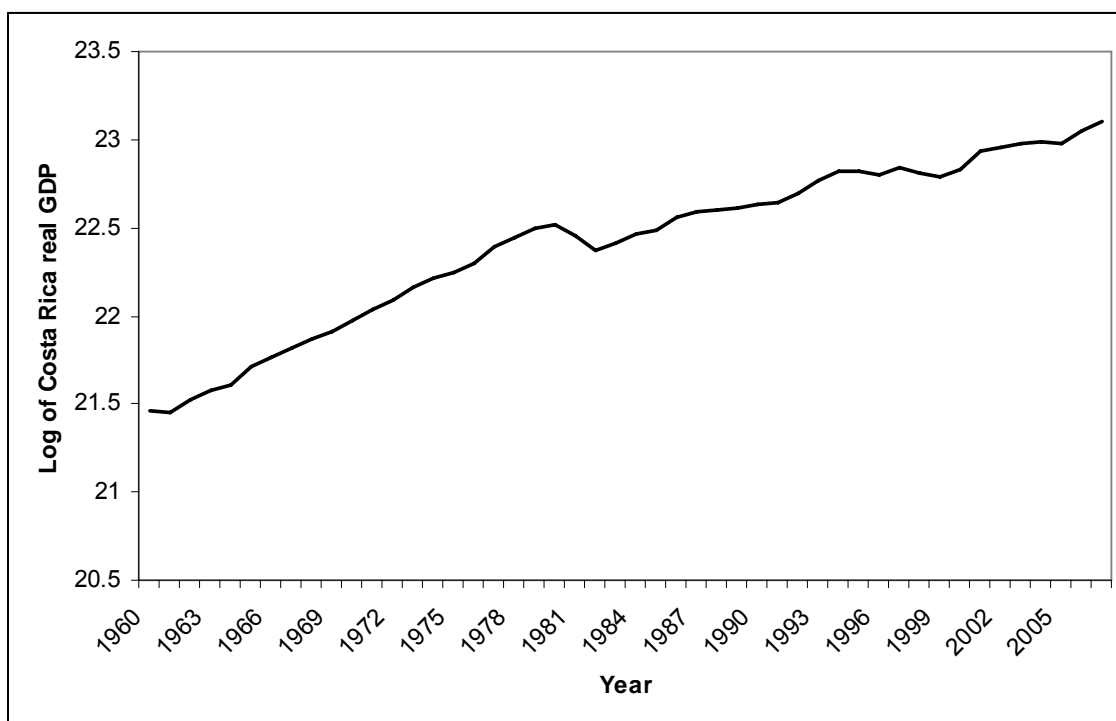


Figure 8: Log of Costa Rica real GDP at 2000 US\$ constant price (1960-2007).
Source: World Development Indicators, World Bank (2008).

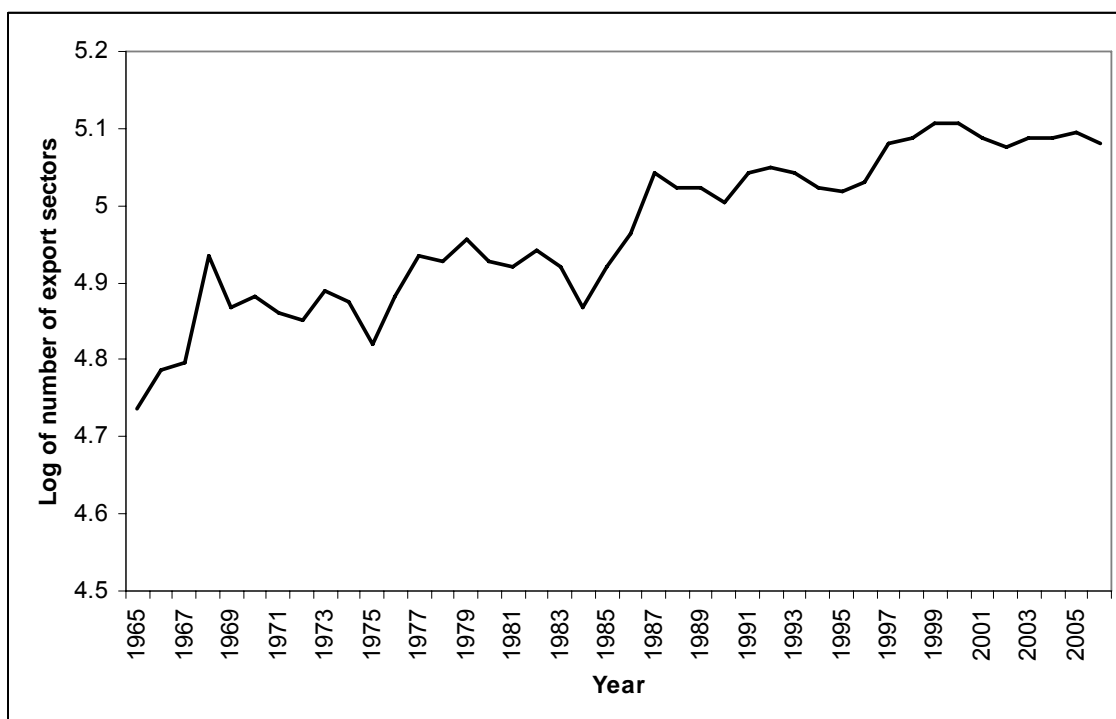


Figure 9: Log of the number of export sectors in Costa Rica (1965-2006).
Source: COMTRADE

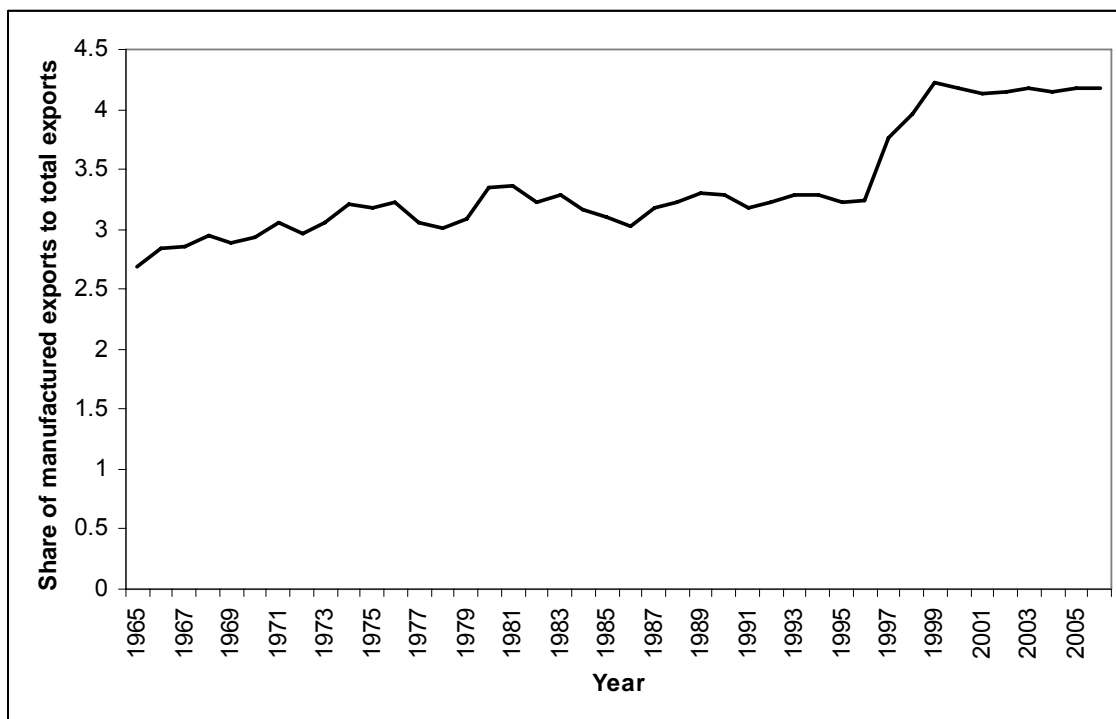


Figure 10: Log of share of manufactured exports to total exports in Costa Rica (1965-2006).
Source: World Development Indicators, World Bank (2008).

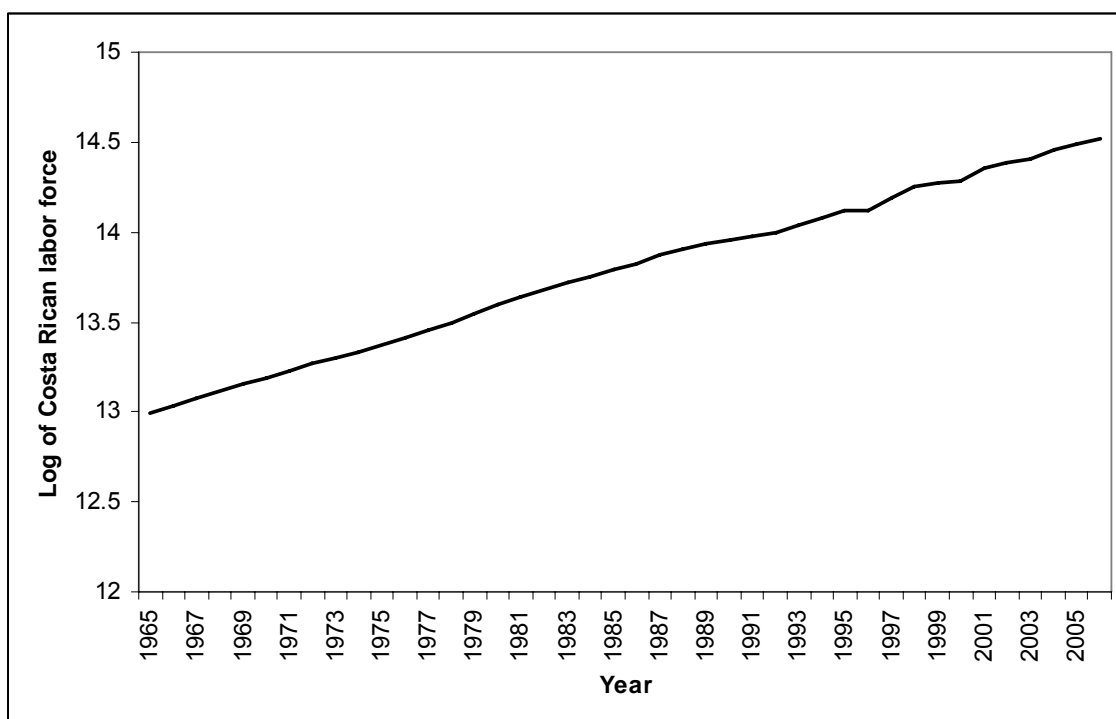


Figure 11: Log of Costa Rican total labor force (1965-2006).
Source: World Development Indicators, World Bank (2008).

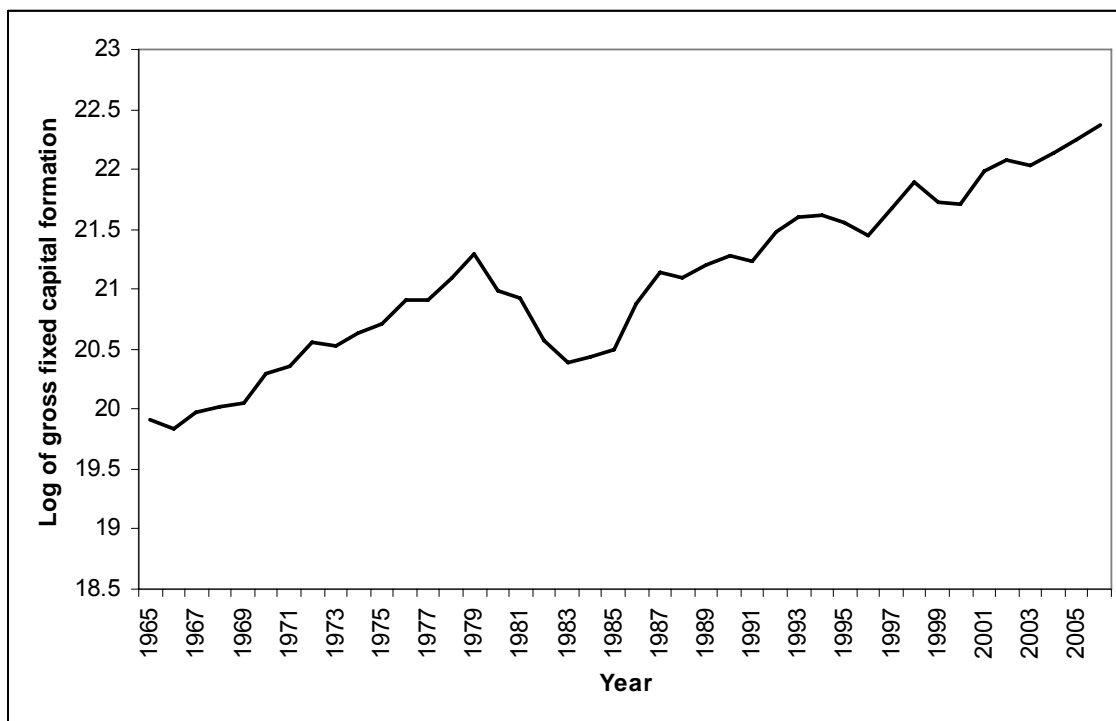


Figure 12: Log of gross fixed capital formation of Costa Rica (1965-2006).
Source: World Development Indicators, World Bank (2008).

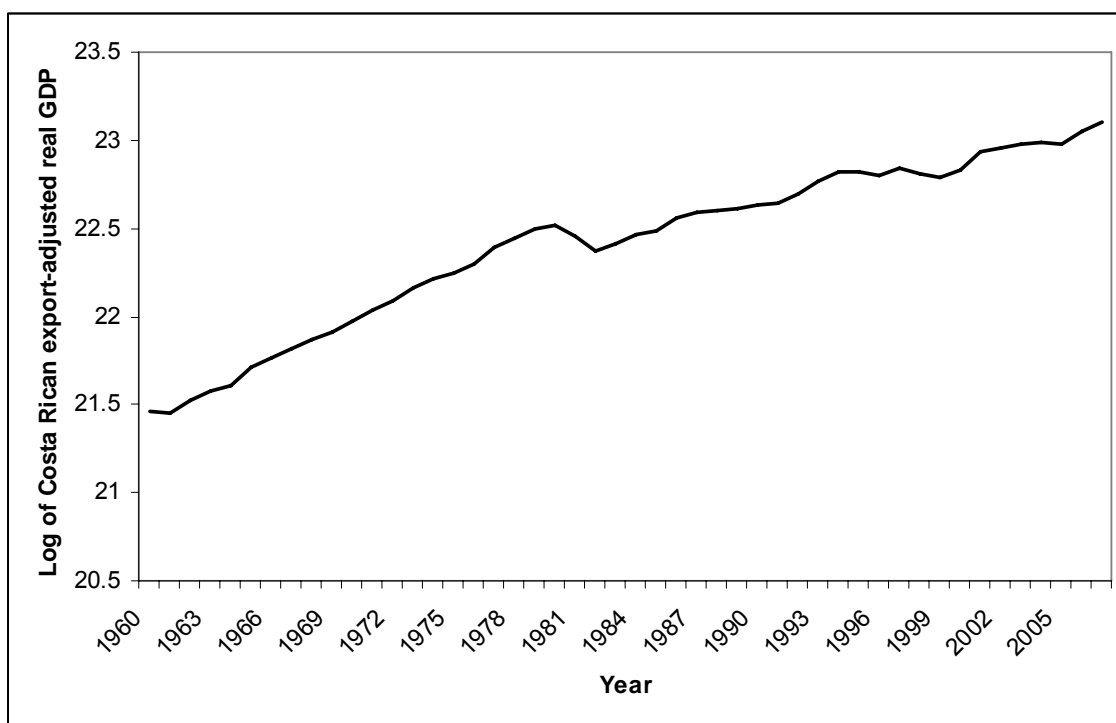


Figure 13: Log of Costa Rican export-adjusted real GDP at 2000 US\$ constant prices (1960-2007).
Source: Author's own calculations.

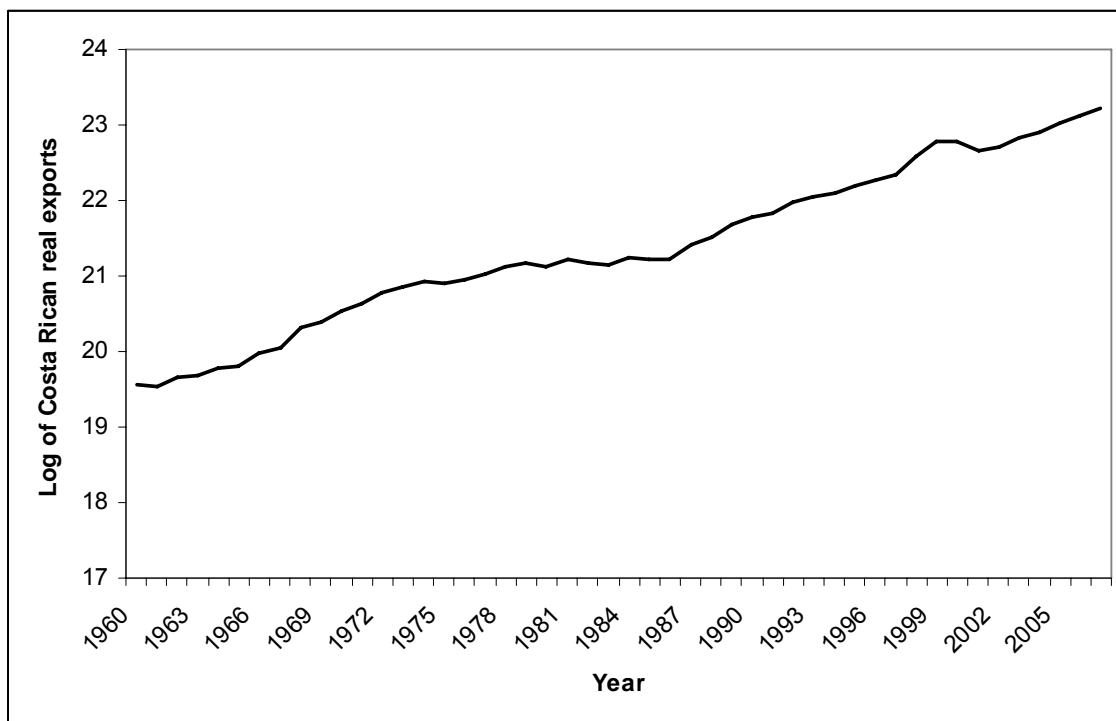


Figure 14: Log of Costa Rican real exports at 2000 US\$ constant prices (1960-2007).
Source: World Development Indicators, World Bank (2008).

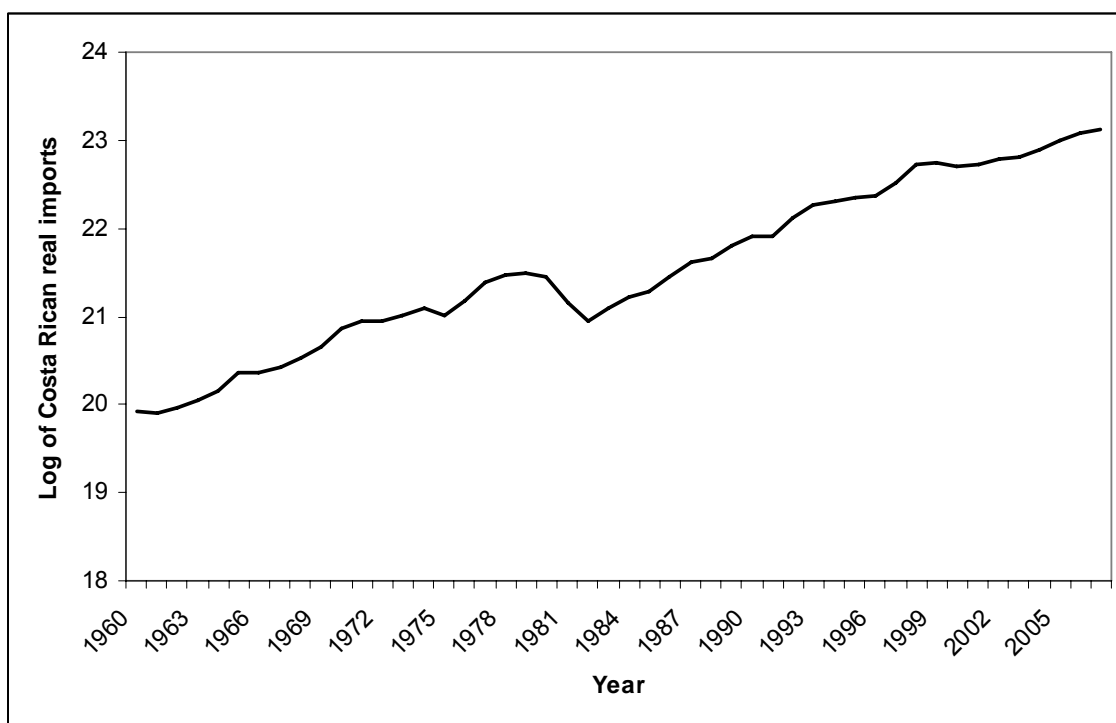


Figure 15: Log of Costa Rican real imports at 2000 US\$ constant prices (1960-2007).
Source: World Development Indicators, World Bank (2008).

VITA

Gustavo Filipe Canle Ferreira was born in November 1975, in Braga, Portugal. He graduated from Cooperativa de Ensino Universidade Lusíada, in October 2001, where he received the title of bachelor in science in economics. After the completion of this degree he worked for the Banco Espírito Santo as a banker. In August, 2001, he enrolled in the graduate school at McNeese State University, where he obtained the degree of master in business administration in December, 2004. In January, 2005, he was admitted to the doctoral program in the department of Agricultural Economics and Agribusiness at Louisiana State University. Currently he is a candidate for the degree of Doctor of Philosophy.